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"The Call of the Wild"

HAVE you gazed on naked grandeur where there's nothing else to gaze on.
Set pieces and drop-curtain scenes galore,
Big mountains heaved to heaven which the blinding sunsets blazon,
Black canyons where the rapids rip and roar?
Have you swept the visioned valley with the green stream sneaking through it,
Searched the Vastness for a something you have lost?
Have you strung your soul to silence? Then for God's sake go and do it;
Hear the challenge, learn the lesson, pay the cost.

—Robert W. Service.

Upper Virginia Lake, High Sierras. Photo by Harry Perry, A. S. C.

ALBERT SUMMERS HOWELL ELECTED TO HONORARY MEMBERSHIP IN A.S.C.

Former Michigan Farmer Boy, Now Outstanding Figure in Mechanical and Motion Picture World, Third Man to Be Thus Honored. Other Two Are Thomas A. Edison and George Eastman.

AT THE last general open meeting of the AMERICAN SOCIETY OF CINEMATOGRAPHERS, Mr. A. S. Howell was unanimously elected to Life Honorary Membership in that Society.

This token of affection and gratitude was tendered by the Society in recognition of Mr. Howell's outstanding accomplishments in behalf of the Motion Picture Industry in general and of the CINEMATOGRAPHERS in particular.

Mr. Howell's life history is truly inspiring. From a farm in the lumber region of Northern Michigan to a position of world-wide recognition is, in brief, the story of Mr. Albert Summers Howell, Chief Engineer of the Bell & Howell Company of Chicago.

Those familiar with the educational facilities offered by lumber towns in Northern Michigan in the 80s and 90s will appreciate the fact that this farm boy, born in 1880, was forced to gain his early training under difficulties. But perhaps the very hardships he met contributed early to moulding the character, which now serves him so well in the continual development of equipment vital to the progress of the Motion Picture Industry.

In 1890 the Howell family moved to Indiana, where the 10-year-old boy worked intermittently in lumber camps and on his father's farm, attending the small town school whenever he could be spared, and keeping up his studying as best he could evenings at home during the season when his help was needed on the farm. He took special delight in keeping the farm machinery in repair and in all things mechanical about the farm and the lumber camp. But sawing, splitting and piling cord wood, plodding behind the ox-drawn plow, and planting and cultivating corn, did not offer the outlet he wanted for his rapidly developing mechanical inclinations, so the news that the family was to move to Chicago was welcome indeed.

1895 found the Howells established in their new quarters in Chicago, and young Albert working as an apprentice mechanic with the Miehle Printing Press Company. His salary was small, but he was working with machinery, there was much to be learned, and he enjoyed the work. From his earnings as much as possible was saved and when the savings permitted it he again took up his studies, enrolling in night school courses, first in High School, and finally in Armour Institute of Technology. To gain a college education under such conditions called for unusual perserverance and tenacity of purpose.

Finally his apprenticeship came to an end and he was a full-fledged mechanic. In the next few years he became connected with various small enterprises engaged in the building of such products as carsealing machines, berry box machines, and special machinery for making animal traps. Finally he entered the employ of a machine shop where a large part of the work was the building and repairing of motion picture projectors.

At that time the motion picture industry was in its infancy. Mr. Howell was fascinated with the mechanical operation of the equipment with which he was working. His close study of the projector enabled him to make many suggestions towards their improvement, which were gladly accepted by the manufacturers and users. Outstanding among these improvements upon the early projectors was the rotary framer, which is now used almost on all theatre projection machines.

His keenness in advancing projector design attracted the attention and interest of Don J. Bell, who, having no factory, was "farming out" the building of cine equipment to various machine shops, one of which was that in which Mr. Howell was working. Mr. Bell, appreciating the intensive and thorough understanding, as well as the active inventive ability which characterized Mr. Howell's suggestions, offered him a position, which later, in 1906, led to the incorporation of the Bell & Howell Company. A small shop was rented and manufacturing activities began late in 1906 and early in 1907. Mr. Howell was now in his element, in business for himself and working with the machinery that so fascinated him.

Albert Summers Howell

Soon it was evident to Mr. Howell that no matter how accurately a projector was designed and manufacured, it was practically impossible to obtain projection free from flicker and unsteadiness, unless all the machinery used in the Motion Picture Industry was designed and constructed with utmost precision. Perforators, cameras, and printeds were to be so constructed that the tiny image photographically impressed upon the film could be enlarged manifold upon the screen without the spectator being aware of such enlargement. To obtain this effect, which was to have such a tremendous influence on the success of motion pictures, Mr. Howell attacked the problems inherent to it with the thoroughness and the patience of a man of science, coupled with the enthusiasm of a pioneer.

His earlier work upon motion picture equipment had

made evident to him the need for standardization in film processes. At that time there was an absolute lack of uniformity in perforation, which made distribution of a finished picture difficult and severely limited.

The work conducted by Mr. Howell in the field of standardization not only demanded a broad vision and great confidence in the future of the then nascent industry, but also a courage of convictions, which was most admirable, especially considering the opposition which usually characterizes any revolutionary enterprise.

The Bell & Howell Company, fully confident in Mr. Howell's righteousness and honesty of purpose, stood behind him with all its then small might, and although repeatedly asked to manufacture equipment for handling films not corresponding to the standards inaugurated by Mr. Howell, it maintained very energetically its attitude.

In his decision on standardization Mr. Howell was always guided by considerations of purely technical and scientific nature, and this, coupled with the perfection of design and manufacture of the machinery that he invented, brought about as a natural consequence, a full recognition of these standards, which have been adopted throughout the world.

All the professional film manufactured in America and in many foreign countries is perforated following the Bell & Howell Standards, which permits unlimited exchange of the releases.

In 1907, 1908, and 1909 the new company designed and built film perforating machines, film printing machines and motion picture cameras, all in accordance with their Standards.

The building of the Bell & Howell first cinematographer camera occupied much of Mr. Howell's time during the years 1907 and 1908.

This camera marked a turning point in the whole motion picture industry through its unusual refinements of design and construction, which eliminated all frictions and "static" troubles which were so evident at that time and which were the cause of severe losses to the whole industry.

Not only the camera was designed so as to be immediately considered as the best camera that could be had, mechanically speaking, but also it proved the care with which Mr. Howell took into consideration the exigencies that motion picture work imposed upon the men called upon to operate these instruments. A turret permitting the operator to have at his almost instant disposal four lenses of different optical properties, was one of the most visible, if not the most important, innovations incorporated in this camera. For the first time in the history of motion picture "fading," "fade-out," and "lap dissolves" were made possible by automatically changing the angular aperture of the shutter. The subtle design and the perfect manufacture of the main cams of the feed and take-up sprockets, and, above all, of the shuttle mechanism, amply justified the tremendous popularity which was enjoyed by this camera from its very inception.

For the first time in the history of cinematography, Mr. Howell conceived the use of pilots in both the perforator and the camera, which assured an undreamed of accuracy of registration, which contributed to a great extent to the popular success of motion pictures. This remarkable development, which assumed the proportions of an invention, has benefitted the general public insofar as it has made possible utmost steadiness in the projection of pictures, eliminating all fatigue of the eye, and it has also benefited the cinematographer and the laboratory motion picture workers insofar as it relieved them of many of the mechanical cares and worries with which they were besieged prior to Mr. Howell's inventions, and permitted them to devote most of their efforts to the artistic and technical achievements which characterize the motion picture productions of today.

As important as the designing of the Bell & Howell camera is Mr. Howell's conception of the film printing machine. At the time the Bell & Howell Company was organized, films were printed by the slow process of handling each individual scene separately and light changes compensating for varying densities of the negatives were made by hand. Mr. Howell's continuous film printer made possible not only a greater accuracy of the registration, but also a great reduction in laboratory work as it automatically adjusted itself for varying exposures. Since every laboratory was naturally interested in reducing its overhead expenses and increasing its production. Mr. Howel's printer rapidly achieved the recognition and distribution of his other products. Today most of the professional film is printed with this machine and perhaps most of it is thrown upon the screen by projectors which include Mr. Howell's contributions in their design.

The most outstanding feature of Mr. Howell's printer consisted in the elimination of creepage or slippage of the film.

A strip of negative film shrinks after exposure and processing and becomes, therefore, shorter than the positive film. When two strips of films are carried through the printer together it is impossible to make them register perfectly before the printing aperture unless some provision is made to offset the difference in length. Mr. Howell conceived the equalization of these differences by providing a convex surface over which the films must travel on their way past the printing aperture.

The radius of this surface is such that when the positive and negative films are in position upon it, with the positive film on the outside, the greater length of the positive film is counterbalanced by the increase in length of its arc over that of the arc of the negative film. The perforations in the two strips of film are thus made to register perfectly and all creepage or slippage of film, because of shrinkage, are eliminated.

This outstanding and revolutionary feature, added to very cleverly devised film and light controls, are further proof of Mr. Howell's versatile inventive genius.

A very convenient time and labor-saving slicing machine was the next of Mr. Howell's contributions. During the twenty-five years that Mr. Howell has devoted solely to the improvement of motionp icture equipment, he has given the Industry a number of other machines, attachments and improvements, each one of which stands as an outstanding page in the Book of Motion Picture Progress. The great popularity of motion pictures in general brought about rather recently a considerable expansion in amateur cinematography, and here again we find Mr. Howell foremost in the invention, designing and manufacturing of apparatuses, which although devised for use in connection with sub-standard film and for home consumption, present nevertheless all the characteristics of perfection of execution which made the professional equipment to be recognized throughout the world.

It was Mr. Howell that first could idealize an automatic camera of extremely reduced proportions, which could effectively function at a terrific speed of 128 pictures per second. We mention this 16 millimeters ultra-speed camera because in all its outward appearances it does not differ from the well-known *Filmo* 16mm. *Amateur Camera*, and because this speedin its operation was made possible only by thoroughness of Mr. Howell's conception.

It is worth mentioning that all progresses and advances made by the Motion Picture Industry were immediately adapted by Mr. Howell to the equipment already in existence. This is, to the writer, the most flattering tribute that could be paid to Mr. Howell's foresight. It is truly remarkable that a camera which was designed in 1907 and 1908 could be with but minor alterations successfully adapted to the intricate exigencies of the projection of sound pictures of 1929.

Today Mr. Howell is busy at work in his office and in his completely equipped private laboratory in a new exclusive engineering building, recently erected by the Bell & Howell Company. A staff of 200 engineers and technicians are collaborating with him, guided and inspired by his extremely active intellect. While the six story production plant, employing over 1000 employees, are manufacturing the proven devices of the engineering laboratories, perhaps he is busy working on a new accessory for the *Filmo* camera—maybe on some new development for the professional industry—but we may rest assured that whatever is the object of this concentration, his contribution to the art of cinematography is worthy of note, worthy of the man, and worthy of the motion picture industry.

His keen understanding of the problems involved in mechanical science of motion pictures has carved for him a niche in the Motion Picture Hall of Fame and his unassuming personality has gained for him the respect and the affection of all who have been privileged to come in contact with him.

The *American Society of Cinematographers* is honored that Mr. Howell has accepted a Life Honorary Membership in its fold, and with pride and gratitude inscribes his name in golden letters alongside of the names of Mr. Thomas Alva Edison and Mr. George Eastman, who by their remarkable genius have brought comfort and happiness to millions of struggling humans.

THE EMOTIONAL APPEAL OF COLOR

An Unusual Discussion of the Artistic and Emotional Reactions to Color From the Pen of a Distinguished Scientist.

By LOYD A. JONES

This article is the second part of a paper, "On Tinted Film for Sound Positives," presented at the Spring meeting of the S. M. P. E., New York City, May 6-9, 1929. This paper explains in detail the new Sonochrome Film announced by the Eastman Kodak Company, which is supplied in Sixteen tints. The first part of the paper, printed in our July issue, dealt with the objective or physical characteristics of tinted positive film base. This part takes up the artistic and emotional. This paper is also Communication No. 393 from the Kodak Research Laboratories.—Editor's Note.

THE application of these colors to a motion picture production involves the consideration of a radically different group of relationships belonging to that phase of the motion picture industry which has been designated, for want of a better term, as artistry.[2] While it may be presumptious on the part of the author of this paper to invade a field so remote from that of his accustomed activities, he feels that there may be some members of the Society more concerned with the artistic and emotional reactions than with the cold facts of scientific technology, who may be interested (or perhaps amused) by some thoughts and suggestions as to the possible emotional and artistic value of color applied to the motion picture screen.

Loyd A. Jones

Some of you may have been present on one or two previous occasions when the author has had the privilege of presenting to this Society papers discussing the use of color[3,4] in more or less abstract static and dynamic forms as a valuable element in a motion picture program. You are already aware therefore that he has long been interested in the possibilities of color as an aid to the creation of dramatic atmosphere. In fact he is firmly convinced that color, *per se*, if properly employed may exert a powerful influence on the emotional reactions. He therefore begs your indulgence while in the following pages a few ideas along these lines are presented for your consideration.

The literature pertaining to the language, symbolism, and emotional effects of color, though scattered and fragmentary, extends over the entire period of recorded history. Mythology is replete with the symbolism of color. On the Greek stage the colors of the costumes were adjusted to the mood of the action. Color is intimately associated with the entire history of the Christian Church and a very definite color symbolism has developed. Color has been so inseparably linked with sensory experience throughout the evolution of mankind that it has acquired by objective and subjective association definite and important emotional value.

No attempt can be made within the confines of this paper to give anything approaching a complete bibliography of the subject. One or two references, however, may be valuable to those interested. Field in his *Chromatography*[5] discusses various colors from the standpoint of their emotional value and gives numerous references tending to show rather general agreement as to the character of such effects. A quotation given by Field[6] from Opie,[7] an English artist of the late 18th century, is of particular interest.

"Every passion and affection of the mind has its appropriate tint; and coloring, if properly adapted, lends it aid, with powerful effect, in the just discrimination and forcible expression of them; it heightens joy, warms love, inflames anger, deepens sadness, and adds coldness to the cheek of death itself."

The most recent, complete, and by far the best publication on this subject is that by Luckiesh.[8] This is a carefully considered conservative treatment in which are given numerous data collected from many fields along with the valuable contributions of the author to this subject. The book will repay careful study and is earnestly recommended to the attention of those interested. The following quotation[9] is of interest as it indicates the attitude of the author toward the subject and is an admirable of the point of view which should be taken by any investigator statement of the point of view which should be taken by any investigator in a little known field.

"It would be unscientific to deny the existence of a language of color because we do not understand it thoroughly at present and quite unprogressive to reject the possibility of finally completing the dictionary of this language. Color experiences are indeed very intricate at present but it is likely that this is due to our scanty knowledge of the elements and processes involved in the emotional appeal of colors, and to our inability to interpret and to correlate properly the various factors. Much knowledge must be unearthed before a rudimentary dictionary of this language is available but first the scientific attitude should admit the possibility that the language of the group of experiences associated with color eventually will be understood."

In considering color from this point of view it must be remembered that we are now dealing with color as it appears, that is, the sensation evoked in consciousness, rather than with the objective character of color as determined by its physical characteristics. All of the various factors, therefore, which determine the character of the subjective reactions, such as simultaneous contact, previous retinal excitation, and many others must be considered in attempting to define the emotional reaction that may be induced by subjecting the eye to stimulation by radiation of known physical composition. Moreover, a color may, just as a word or phrase, have more than one emotional value or significance; and, as in the case of the spoken language, the intended meaning must be determined by the contextual factors such as general character of the scene structure, subject matter of preceding sequences, type of dramatic action, etc. For instance, a green matching in hue and saturation characteristics the color of spring foliage, may connote by direct subjective association, springtime, trees, grass, gardens, etc. Used on radically different types of scenes, however, such for instance as interiors, it may be found particularly valuable for suggesting by indirect or subjective association certain more abstract concepts, such as youth, freshness, hope, aspiration, and those moods closely linked in our consciousness with the springtime of life.

A rather careful analysis of the admittedly rudimentary color language indicates that the great majority of existing connotations may be classified in two rather distinct groups which may be designated as: (a) direct objective association, and (b) indirect subjective association. It is relatively easy to quote many examples of the class *a* correlations. For instance, sunlight is quite definitely suggested by yellow. Now, as a matter of fact, sunlight is not yellow and it has been shown definitely that when the retina is exited by sunlight or by radiation of identical spectral composition in a visual field from which all possible contrasting areas have been removed, the sensation evoked is hueless, that is, corresponding to gray or white. A white object, however, illuminated by sunlight under a clear blue sky appears yellow. It seems quite evident, therefore, that through centuries of evolution a definite conscious or subconscious relationship between sunlight and yellow has been so established that under artificial conditions yellow almost invariably suggests sunlight. Thus a motion picture scene printed on yellow base, such as tint No. 6 (Sunshine), should definitely suggest sunlight illumination whether it be an exterior flooded with light from

the sun or an interior into which light is streaming through open doors or windows.

In a similar manner there seems to be a very definite relationship between other colors and the well known artificial sources of heat and light. Artificial illumination of interiors is definitely suggested by a color which is either more saturated or has a hue somewhat more orange than the yellow suggesting sunlight. Firelight may be suggested by a color even more reddish in character. Such examples of objective association can be multiplied almost indefinitely. Subjective associational relationships are somewhat more tenuous and difficult to establish with certainty. Some of these undoubtedly have been built up in consciousness by somewhat artificial association of certain colors with definite emotional states. Others of these correlations may probably be traced to extensions of more direct associational factors. For instance, there seems to be a character of warmth associated with all of the colors in the yellow, orange, red, magenta category; while the remainder give a definite impression of cold or coolness. This is very probably an extension of the more direct associational value arising from the color of sunlight and fire and the atmospheric conditions normally associated with coldness.

Table III

Total Number of Replies from 63 Subjects Indicating Three General Types of Mood-Reactions Due to the Twelve Different Colors

	Exciting Influence	Tranquilizing Influence	Subduing Influence
Crimson	41	0	10
Scarlet	56	0	0
Deep orange	59	0	0
Orange-yellow	55	6	0
Yellow	53	6	0
Yellow-green	14	39	5
Green	28	32	0
Blue-green	32	23	6
Blue	11	21	30
Violet-blue	0	17	45
Violet	0	6	54
Purple	3	1	48

Table III. Well's data of the affective influence of various colors.

The association of color with certain temperamental phases of life, such as youth, maturity, old age, etc., can probably be traced to an extension of a more direct association with the seasons of the year. Space does not permit us to carry this analysis into greater detail, but a serious study of this subject can hardly fail to convince the fair-minded student that there is really some definite and psychologically sound relationships between colors and emotional states.

Although a great deal of the work on this subject has been of purely qualitaive, and perhaps temperamental type, there are available some rather definite and significant data. For instance, Luckiesh [10] (*loc. cit.* p. 200) gives some very interesting data compiled by Wells[11] relative to the general types of mood reactions produced by twelve different colors. These data are shown in Table III. They are derived from sixty-three subjects and the correlation is indeed striking. There seems to be no escape from the conclusion that these colors designated as yellow, orange-yellow, deep orange, scarlet, and crimson have a definitely exciting influence. In the mid-spectrum yellow-green, green, and blue-green, seem to be definitely tranquilizing or soothing. Blue, violet-blue, violet, and purple are depressive or subduing. The student who approaches this subject with an open mind and with the intention of seriously searching for correlation factors can scarcely fail to be convinced that there is something of a very tangible nature which can be ascribed to a definite psychological reaction to color.

The chart in Fig. 7 shows the affective values of the various colors as computed from Wells' data. No definite information is available relative to the dominant wave-length of the colors used by him so they are plotted arbitrarily at equal intervals along the base line. The ordinates are computed from the data in Table III, each number being reduced to a percentage of the total number of decisions. The curves have the following significance:

A, curve of exciting influence;
B, curve of tranquilizing influence;
C, curve of subduing influence.

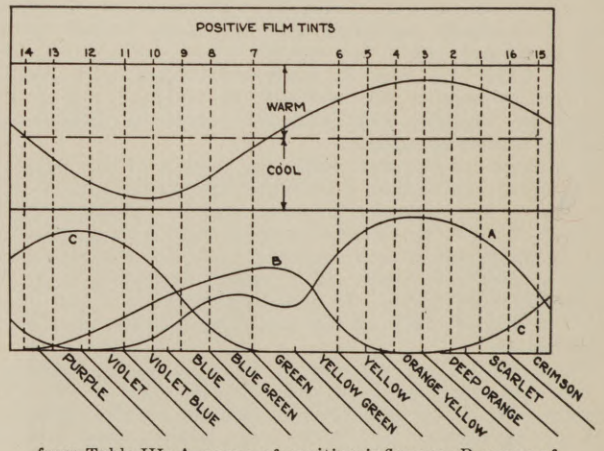
These curves are surprisingly similar in general shape and position to the three fundamental retinal excitation curves for red, green, and blue-violet. Although the present data are too meager to establish any correlation between emotional effect and the retinal processes, the similarity is certainly sufficient to encourage some further consideration.

Along the top line of the chart are placed the numbers referring to the positive film tints, the position of each relative to the color scale at the bottom being determined as carefully as the qualitative data will allow. The dotted lines dropped from these points out the three curves and the heights of these ordinates give some idea of the character and strength of the mood reaction which each color may be expected to induce.

In the upper part of the chart is drawn a curve showing in a qualitative way the position of the warm-cool mood reaction scale. This, it must be confessed, is based on very insufficient evidence, being determined by the rather casual judgments by a few observers working under poorly controlled conditions. In the following paragraphs an attempt has been made to give a brief description of the visual and psychological characteristics of the film tints. It is evident that no very definite statements can be made or rigid specifications set up for the use of these colors. It is hopes that these rather disconnected and rambling remarks relative to the various colors may be of interest to those concerned with working out the application of color to the motion picture screen and serve as a foundation, however insecure, upon which something of real value may be built by others more qualified by training and temperament for such work. Although these characterizations of the symbolic and emotional values of these colors are necessarily tinged by the author's own reactions and by the results of his own introspective analysis, they are based, in so far as is possible, upon a careful summary and integration of data derived from the available literature. They should therefore represent approximately the reactions to be expected from the average observer.

Tint No. 17, Argent. This is a hueless color, a silvery gray showing no chromatic characteristics. It may be regarded as the zero or starting point on the scale of saturation or color strength. It is very necessary as a means of establishing a visual accommodation in terms of which a hue may be appreciated by contrast. It may be used to fatigue the eye to the point of monotony after which the presentation of a hue will have enhanced effect.

Tint No. 6, Sunshine. A clear brilliant yellow approximately complementary to sky-blue, therefore quite closely matching the subjective color of sunlight when seen in contrast to blue sky. The visual transmission is high, 83 per cent, therefore it is particularly adapted for use on a scene designed to give the impression of brilliant sunlit conditions and where an interior is obviously illuminated by sunlight entering through windows and open doors. This color is definitely warm but not to the same extent as Candleflame. Firelight (*Continued on Page 36*)



from Table III: A, curve of exciting influence; B, curve of tranquilizing influence; C, curve of subduing influence.

A.B.C. OF SOUND PICTURES

By JOSEPH A. DUBRAY, A.S.C.

(Fifth Paper)

IT HAS been previously stated that an electric current is always surrounded by a magnetic field. This field has a magnetic influence upon the medium in which it flows. If an insulated wire is coiled and a steel bar is inserted and held suspended between its coils, no phenomenon is apparent, but if an electric current is made to flow into the wire, the steel bar becomes magnetized.

The process of magnetization is caused by an electric displacement in the medium surrounding the conductor. The amount of this strain is called the "Magnetic Flux".

The influence that the magnetic flux exerts upon bodies in a neutral state is called "Induction".

If the electrified body possesses electro-kinetic energy the phenomenon of induction gives rise to an electric current in a neutral circuit placed in its proximity. This current is termed "An Induction or Induced Current."

Jos. Dubray, A.S.C.

If coils of insulated wire are inserted between two masses of soft iron, or any other metal characterized by great magnetic permeability, that is to say, having the power of becoming easily magnetized, and the current of a battery is made to circulate in the wires, the two metallic masses become magnetized, one with one polarity, and the other with the opposite polarity. If, instead of passing an electric current in the wires, these are made to move across the magnetic field existing between the opposite poles of a magnet, a series of alternatively positive and negative currents, that is to say, currents which flow alternatively in opposite directions are produced.

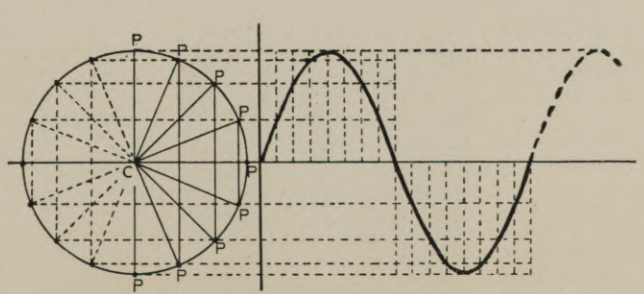
The induced currents, thus produced, reach a certain maximum value first in one direction, and then in the opposite, and they have a value of Zero at certain instants in the intervals between the maxima.

If this cycle of values is repeated during a certain time the current is called "Periodic" and the number of periods or cycles which occur during one second of time is called the "Frequency" of the current. The ordinary dynamo is based upon this principle.

Alternative currents are referred to as "Low Frequency" or "High Frequency" in reference to their number of frequencies. High frequency currents are characterized by some thousands periods per second. Currents possessing these characteristics are called "Alternating Currents" in opposition to the "Direct Currents", such as those produced by batteries, and which constantly flow in one direction only.

In one extremely important case where the quantity of electricity of an alternating current, which is transferred in one direction, is equal to the one transferred in the opposite direction, the alternating current may be graphically represented by a curve having the mathematical form of a Sine Wave.

The name of Sine Wave is derived by the fact that the amplitude of the curve and, therefore, the electro-motive force represented by it, is proportional at any instant to the trigonometrical function called the "Sine" of the angle PCP and which serves as a means by which a mathematical value can be expressed for the angle. Currents which vary periodically, but in which the quantity of electricity flowing in one direction is greater than the quantity which flows in the opposite direction, are called "Pulsating Currents." Pulsating currents are produced either by ratifying alternating currents, or by varying direct currents, or by superposing an alternating current upon a direct current. It is quite obvious that *the strength* of an electric current is dependent upon the electro-magnetic influence of the field surrounding the conductor in which the current is generated.



Drawing illustrating graphically the mathematical form of the Sine Wave

In the matter of sound transmission, and later of sound reproduction, magnetism played the most important part. The invention of the telephone is outstanding in this field. It is quite obvious that the induction current generated in a telephone transmitter, as discovered by Graham Bell, would be rather small and the losses suffered through the resistance of the conducting wires would limit to a great extent the distance at which telephonic communications could be held. It was soon discovered, however, that if a current could be made to flow in the wires the induction current, created in the transmitter, could be superposed to the continually flowing current and at the receiving end currents of sufficient strength could be obtained, even at great distances, to operate the diaphragm of the instrument. It was, nevertheless, found necessary to amplify the strength of this current and up to recent years the only electrical amplifier available was a combination of telephone receiver and carbon transmitter, based upon the variable resistivity of granules of carbon.

Carbon is a semi-conductor the resistance of which is diminished by compression, and vice versa, diminution of its compression increases its resistance. In the telephone, the minute alteration in the compression of the carbon, and consequently, the electrical resistance of the circuit, vary in accordance with the sound waves which control the action of the diaphragm. This apparatus produces, however, only a very small increase in the strength of the current and the reproduced sound cannot be distinctly heard unless the receiver is kept very close to the ear. Due to its construction it is also necessary, at the transmitting end, to hold the apparatus quite close to the lips in order to impart vibrations of sufficient amplitude to the diaphragm.

It is quite obvious that these limitations had to be eliminated in the developing of the transmission or reproduction of sound as it is understood today and practiced in radio and sound pictures.

The main principle of the systems of sound recording and the reproduction may be summarized as a transformation of sound waves into an electric current, which electric current, in turn either actuates a phonographic stylus or is transformed into light energy, modulated in accordance with the modulation of the current itself; or, finally, actuates either a mechanical or an optical valve, also in accordance with its modulations or differences in strength.

High frequency currents of Sine Wave form, and possessing great steadiness, may be generated by instruments, the invention of which is of recent date and which play an essential part in sound recording and reproducing apparatuses, as well as in radio transmission.

We refer to the Three Electrode Vacuum Tube. This remarkable invention became available only within the past few years and its extremely important properties as a generator, a detector and an amplifier of high frequency currents, coupled with its extreme flexibility and constancy, afforded the solution of the problems which confronted the early researchers in the art of sound recording and reproduction.

The vacuum tube also called "The Electron Tube" con-

(*Continued on Page 20*)

SOUND MEN AND CINEMATOGRAPHERS DISCUSS THEIR MUTUAL PROBLEMS

Sound Experts from Hollywood Studios Are Guests of A. S. C. at Meeting Held to Bring About Better Cooperation and Understanding.

AIMING to bring about a better understanding of the problems of the sound engineers and the cinematographers, the American Society of Cinematographers had sound engineers from the various studios of Hollywood as guests on the night of July first.

Perplexing questions that have been facing both groups since the advent of the talking pictures were brought up for discussion and given a thorough airing. The result was that the members of the A. S. C. and the sound engineers went away from the meeting with a better understanding of the other's problems, and with a spirit of cooperation bubbling over within them of such magnitude that it seems inevitable that a distinct benefit will come to the entire motion picture industry.

This special meeting was conceived by President John F. Seitz of the A. S. C., who, with members of the Research Committee, worked for several weeks on the preparations. Always a leader in every movement for the advancement and betterment of cinematographic matters, the officers of the A. S. C. felt that such a meeting would be of infinite value to the industry and, judging from the discussions of the evening, they were not wrong.

Seven outstanding parallel questions dealing with sound and cinematography were brought up for discussion and were threshed out with a spirit that was refreshing in its frankness and which gave enlightenment to all concerned.

The parallel questions taken up follow:

1. *Photography:* What would you consider an ideal condition for achieving perfect photography?
   Sound: What would you consider an ideal condition for making a perfect voice record?
2. *Photography:* Since ideal photographic conditions cannot now exist as they did when the picture alone was to be considered, what can the sound men do toward the approximation of this ideal photographic condition for you?
   Sound: Since this ideal condition for recording cannot be completely atained in making a talking picture, what can cinematographers and others concerned in making the picture contribute toward the approximation of this ideal condition?
3. *Photography:* Are arc lights ever indispensable to the making of a good picture or to the achievement of a desired effect?
   Sound: Are arc lights equipped with choke coils just as satisfactory to the sound men as incandescent lamps?
4. *Photography:* Do camera booths seriously impair your photographic quality, and is silent camera a probability of the near future?
   Sound: Would it be possible to use electrical filters in the lines to "cut out" the frequencies caused by camera noises—this would be a step toward taking the cameras out of the booths?
5. *Photography:* Can a simple, effective and business-like method be devised for masking the microphone?
   Sound: Can a microphone be developed to enable higher placement above the heads of the characters?
6. *Photography:* What particular hardship is inflicted upon the cameraman who is forced to expose and arrange his lighting to secure the proper pictorial balance and contrast, when development is designed to secure an overall Gamma of Unity which is considered the proper development for perfect sound reproduction?
   Sound: What steps can be taken to bring about a closer and more balanced exposure between picture and sound track so that the film may be developed for the picture, but at the same time be perfect development for the sound?
7. *Photography:* To what extent would cinematography be benefitted by the development of an entirely satisfactory directional microphone?
   Sound: What are the disadvantages, if any, in the use of directional microphones?

Miscellaneous Questions

Are there any indications or possibilities that at some time in the future all recording will be done with either wax or film, or that all recording will be made on film and duped or reproduced on wax?

Briefly, the following outstanding points were brought out: Question 1.—(a) An ideal photographic condition exists when we can place our lights and cameras at any desired point, or work without any restrictions whatever.

(b) An ideal or location for making a perfect vocal record would be in the middle of the Mojave Desert, unhampered by cameras, walls or any other disturbing elements.

Question 2.—(a) The sound men could assist the cinematographers by endeavoring to cover from fewer angles in a single set-up. The closer the cinematographer could approach the condition existing before the advent of "talkies," other things being equal, the better his photography should be.

(b) The cinematographer and director could assist the sound engineers in approximating ideal recording conditions if they could arrange their work so that the microphone could be placed from 18 inches to three feet from the actors' heads, by keeping the number of microphones used as low as possible, and by covering fewer angles, except in instances where music is being recorded. In the latter case, owing to the difficulties of maintaining a perfect sound level through a number of scenes when they are broken into shorter lengths, it is advisable to take all the required scenes in one set-up.

Question 3.—(a) Arc lights are at times indispensable to secure a desired effect. If you wish to obtain clear, sharply defined shadow for some specific effect this cannot be satisfactorily obtained with an incandescent lamp, due to the nature of its source. In a very large set, having much detail, arcs are desirable for the sharp actinic qualities. These are exceptional cases but illustrate the point that at times arcs are necessary.

(b) Arc lights equipped with choke coils are fully as satisfactory to the sound men who have used them as incandescents. One studio expressed a decided preference for arc lights, maintaining that tests showed that the spherical shape of the incandescents gave certain echoes that did not exist with the arcs. The arcs, being covered with plain or Florentine glass gave a flat surface, they explained and prevented the echo.

Question 4.—(a) Camera booths seriously impair photographic quality. In photographing through glass it is practically impossible to eliminate chromatic abberations. In addition one cannot always eliminate reflection. (a, 1) Camera manufacturers are steadily progressing toward the realization of a silent camera, but it is problematical as to when this will arrive.

(b) The principal difficulty here is that each camera would have its individual frequency. A filter would have to be fitted for each camera. Further than that a (*Continued on Page 39*)

"SUCCESS"

A Short, Short Story of the Movies

By Hal Hall

Illustrated by John Corydon Hill

NOTHING doing today, Pop," said the casting director. "Call me tomorrow. Maybe better luck then." The old man shuffled along to the outer door of the studio, and with a backward glance, almost akin to despair, buttoned his threadbare overcoat around his neck and made his way out and through the snowdrifts of the Bronx to the subway.

At the casting office of the Luxury Motion Pictures Corporation the old man was listed as: "Charles Stamwell . . . character atmosphere . . . limited wardrobe." Among those in the know at the studio it was whispered that the limited wardrobe had several times deprived him of a small part. But that is neither here nor there, and is the way of the movies.

For five years he had been an almost daily caller at the studio. He had some bits of luck: periods when he worked maybe two weeks at a time for five to seven and a half dollars a day. Old men, with long, white whiskers are not in great demand in pictures, even as just plain "atmosphere." So, generally, the old man was unemployed. How he lived none of the vain, chattering, cosmopolitan group of "extra" folk neither knew nor cared. Most of them put him down as just a doddering, old simp who thought he could be a "movie actor."

"Why don't you quit the acting business, Pop?" the casting director once asked him.

"Because I am going to succeed some day," he answered, after a moment's pause. "I have failed at about everything else all my life. I even failed to hold the most beautiful—oh, Hell!—What do you care about it anyway?" That was the only time he ever spoke about his past or future.

That the old man had nerve he proved one day during the shooting of scenes aboard an ancient freighter some fifty miles off Sandy Hook. The ship was supposed to catch fire and then blow up when a cargo of gun powder was ignited. A special band of "extras" had been secured to leap from the top deck to the water, forty feet below. Somehow or other the old man found himself in this group when the director told them to jump. Instead of spoiling the scene by running away, the old fellow leaped into the sea.

It was not until he had been fished out, half drowned, that the movie people learned he did not know how to swim.

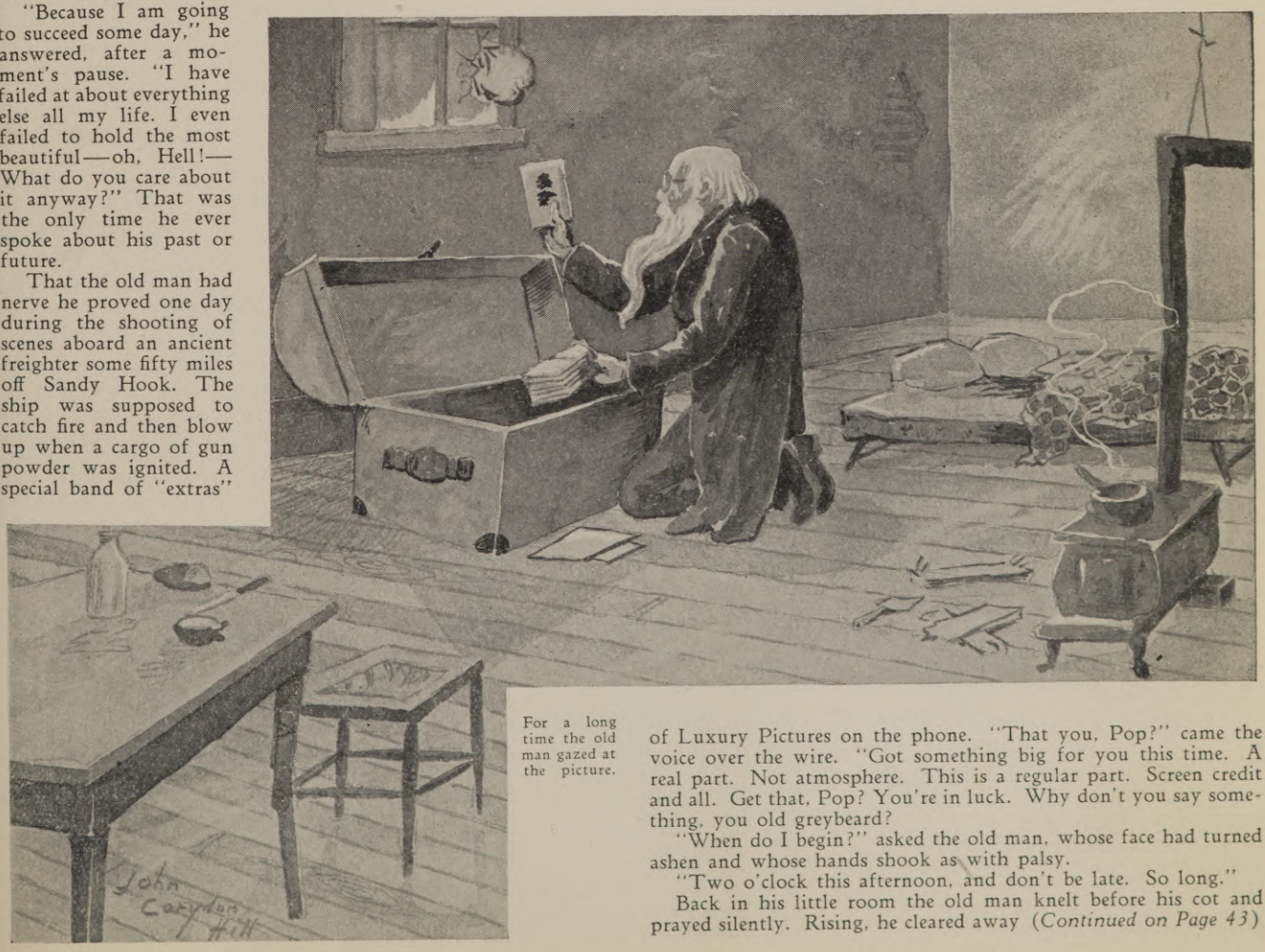
THE long journey to the studio and back, with difficult walking through the snow at either end, taxed the old man to the limit. When he reached his little room in a squalid, crowded tenement in New York's lower East Side he was near exhaustion. With wood from some old broken boxes he kindled a tiny blaze in the little stove that furnished the only heat for this place he called home. When the fire burned out he curled up on his little cot and dropped to sleep with the pangs of hunger gnawing at his stomach. But he was accustomed to that.

WEEKS passed, and with the appearance of crocuses in the parks came new hope in the breast of the old man who stubbornly hung on and refused to admit defeat. Came a bright May morning, and the old man was called to the telephone in the delicatessen store around the corner. It was the casting director of Luxury Pictures on the phone. "That you, Pop?" came the voice over the wire. "Got something big for you this time. A real part. Not atmosphere. This is a regular part. Screen credit and all. Get that, Pop? You're in luck. Why don't you say something, you old greybeard?

"When do I begin?" asked the old man, whose face had turned ashen and whose hands shook as with palsy.

"Two o'clock this afternoon, and don't be late. So long."

Back in his little room the old man knelt before his cot and prayed silently. Rising, he cleared away (*Continued on Page 43*)



For a long time the old man gazed at the picture.

AS THE EDITOR SEES IT

Honor Where Due

PERHAPS no single individual contributes more to the artistry of a motion picture than does the cinematographer. The author may be famous, the scenarist the best in the industry, the director at the head of his profession, and the players all stars, but—what the audience sees on the screen is a picture, and if it is not photographed well the artistry of the above-named workers goes practically for naught.

It is a well-known fact that good photography can—and frequently does—save a mediocre picture. Without causing embarrassment by mentioning names, the writer recalls numerous pictures which have been successes solely because the photography was so wonderful that the audience forgot the poor story and poor acting and ordinary direction.

In other words, a cinematographer is the most important factor in the making of a picture. A director may have freak ideas, but it is the cameraman who puts them over because of his knowledge.

However, the least publicized individual in the picture industry is the cinematographer. Even the prop boy and the wardrobe mistress come in for "breaks" in the papers, but the cameraman usually gets as his reward only the satisfaction of knowing he did a splendid job.

As a whole, this writer believes that the general public is interested in the cameraman—at least as much as in the minor studio officials who come in for much in the way of publicity blurbs. For years this writer has been finding a great deal that is truly of interest in these hard-working artists, and when magazines have printed his stories about the cameramen there has been no uprising against the publications by the public. And so, we wonder why the unusual and often adventurous exploits of these men are not publicized by those who write publicity for the studios.

Surely the public that has gasped over the marvelous effects of "Noah's Ark" would be interested in reading something about Fred Jackman, whose genius gave the picture the marvelous flood effects, and who can take a pail of water and a few twigs and create a forest wilderness with a lake in it. Surely the public would be interested in Hal Mohr, the chief cinematographer on that picture as well as the chief cinematographer on "Broadway," which is now being hailed as a photographic triumph by critics throughout the country. Most of the critics perhaps do not even know who photographed the picture.

Then, there was "Sunrise"—Charles Rosher and Karl Struss were awarded high honors by the Academy of Motion Picture Arts and Sciences. But how many people knew they photographed it! Surely, a word or two about the work of these men would not be amiss, and studio publicity writers would still be getting the name of their pictures in the press.

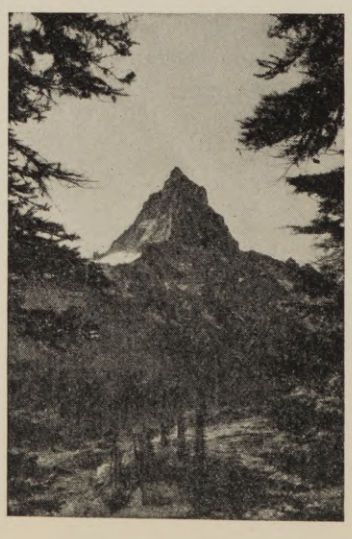
Because of the unusually interesting experiences and background of these men the editor of this magazine is giving a feature story each month about them, and an expression of opinion from our readers will be welcomed. Write us and tell us if you like them, and if you don't.

There are countless cinematographers of extraordinary merit who rarely receive a line of any sort in the press. John W. Boyle, John F. Seitz, Sol Polito, Clyde DeVinna, Ross Fisher, Charles Clarke, Dan Clark, Victor Milner, John Arnold, Tony Gaudio—these are just a few. And our readers will hear more about them later.

Cinematographic Annual

WE TAKE this opportunity to announce that the American Society of Cinematographers, publishers of the AMERICAN CINEMATOGRAPHER, will issue a Cinematographic Annual in 1930.

This annual is to be more than a mere "yearbook." It is to be a work of real art, and a book that will be worth its weight in gold to every individual interested in cinematography, professional or amateur—to say nothing of its value to sound engineers and all those who play a part in the divers arts and sciences connected with motion pictures.



From the point of view of appearance, the annual will be a thing of distinctive and dignified beauty—a book that can take its place in any library and be outstanding.

As to its content—only a volume of great size could fully tell you of this. There will be every formula and table that any professional or amateur cinematographer could ever want. There will be feature articles by the greatest scientists of today, dealing with every phase of cinematography, sound, laboratory work and all allied arts and sciences.

Detailed reports of the technical meetings of the A. S. C. will appear in full. The reports of the A. S. C. Research Committee will be found there. In short, inside the pages of the book will be found material such as the cinematographer and those of allied arts can find nowhere else. Instructive articles by men who daily are creating and giving the industry its very life-blood.

The S. M. P. E.

NOTHING could give us more pleasure at this time than to say a few words anent the Society of Motion Picture Engineers, the organization which provides for this magazine some of its most valued and interesting articles—the S. M. P. E. Transactions which we print from time to time.

The S. M. P. E. was organized in 1916 by a group of men who always have been struggling to further the advancement of the science of motion pictures. Its Constitution tells its object in the following well-chosen words, same being to further "The advancement in the theory and practice of motion picture engineering and the allied arts; the standardization of the mechanisms and practices employed therein, and the maintenance of a high professional standing among its members."

With such a motive for being, it is no wonder the S. M. P. E. has grown and has made its influence felt in all parts of the globe. Constantly on the alert, the society strives to keep its members not only abreast, but ahead, of the times, and its list of transactions present a library of motion picture science practically unrivalled in completeness. The publication of these Transactions has a tremendous permanent appeal, and many of them are even translated and reprinted in publications abroad.

Various committees collect and present to the society the latest data on subjects they are examining, and the Standards and Nomenclature Committee is constantly bringing about organized and uniform methods and equipment instead of the unstandardized chaos which at one time prevailed.

Like the American Society of Cinematographers, the S. M. P. E. co-operates closely with other engineering and picture organizations with the goal better pictures, better methods, ultimately making for bigger and better business for all concerned.

The S. M. P. E. has been reaching out into foreign fields and its London branch has nearly a hundred members. A special effort is being made to increase the foreign activity and the entrance fees for persons living outside of North America have been reduced to one-half, and the society hopes soon to have many branches in the Old World.

Such a society deserves to expand and spread its good work wherever motion pictures are made.

Cooperation

ONE of the most interesting meetings ever held in the clubrooms of the A. S. C. was that on the night of July first when the cinematographers met with sound engineers from the various studios. Problems that have been bothersome since the advent of talkies were discussed with astounding and refreshing frankness and the result cannot but be of benefit to the industry. Cooperation was the keynote of the evening. It is just this spirit of cooperation that has long been an outstanding characteristic of cameramen. It is one reason why they are so valuable to the industry.

THE AGE OF ALIBI

SOME PROPERTIES OF FINE-GRAIN MOTION PICTURE FILM DEVELOPERS

Part Two of a Paper Presented at the Spring Meeting of the Society of Motion Picture Engineers at New York City, May 6 to 9, 1929

By H. L. CARLTON AND J. I. CRABTREE

This is the second installment of Communication No. 388 from the Kodak Research Laboratories, Rochester, N. Y. The first part appeared in the July issue of the American Cinematographer. The third and final installment will appear next month.—Editor's Note.

WHEN Elon is used without hydroquinone with two grams of borax per liter the concentration can be increased to 16 grams per liter. An increase above 4 grams per liter produces very little increase in the rate of development because very little of this is converted to the Elon base which is the active form. If borax is added to convert the Elon into the Elon base, the rate of development increases with the Elon concentration. The gamma produced for a constant time of development oincreases as a linear function of the logarithm of the Elon concentration.

If the Elon is omitted, the hydroquinone concentration can be increased to 15 grams per liter, but the resulting developer has very little developing power. A fair rate of development can be obtained with 10 grams of hydroquinone in the absence of Elon if the borax content is increased to 20 grams per liter (No. 21, Table II). The quantity of Elon and hydroquinone can be reduced to decrease effectively the rate of development. If the quantity of borax is also reduced to 50 per cent (see No. 23, Table II), a developer with the following formula is obtained which gives a still greater decrease in the rate of development.

	Metric	Avoirdupois
Elon	1.0 grams	1.0 lb.
Hydroquinone	2.5 grams	2.5 lbs.
Sodium sulfite (anhydrous)	100 grams	100 lbs.
Borax	1 gram	1 lb.
Water	1 liter	120 gallons

A comparison of the time-gamma curves for this developer (B) and the regular borax developer (A) is given in Fig. 3. This developer can be used very effectively for machine development

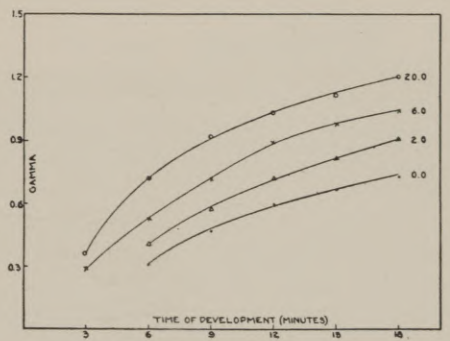


Fig. 4. Time-gamma curves for increasing quantities of borax in the regular formula at 65°F. The borax content is given in grams per liter (Rack and Tank method).

when the construction of the machine demands a developer that is slower than the regular formula and when fresh developer can be added sufficiently fast to compensate for the depletion of the developing agents.

(2) *Effect of Varying the Alkalinity.*—The alkalinity of a developer may be expressed in terms of the pH value which is the logarithm of the reciprocal of hydrogen ion concentration, viz.:

$$pH = 1/C_H$$

where C_H is the concentration of hydrogen ions in the solution.[11] The absolute accuracy of the pH values is open to question, but the measured relative values have been correlated very satisfactorily by a study of the rate of development of experimental developers. Solutions with pH values above 7.0 are alkaline and the alkalinity increases with the pH value. Slightly alkaline developers like the present borax developer lie in the pH range from ate and caustic alkaline developers lie in the range from 11 to 14. 8.0 to 9.0 and the more alkaline developers like sodium carbon-

The pH values were determined by the LaMotte hydrogen ion apparatus which works upon the principle of color change of organic indicator dyes and when used for this purpose may be in error by + 0.1 pH. Developers from Nos. 1 to 6 indicate that the potassium bromide content has no effect on the alkalinity but the alkalinity increases with the borax content and decreases with increased Elon content. The addition of hydroquinone decreases the alkalinity but Elon and borax produce about an equal effect, weight for weight, the former to decrease and the latter to increase the alkalinity of the developer.

The data on the molecular weights of borax and Elon check the above results. Borax (mol. wt. = 381) is dibasic when neutralized by strong acids and is neutralized by one molecule of

Table III

The Gamma and Fog Produced with Varying Concentrations of Borax and Boric Acid in the Buffered Borax Developer

Grams per Liter Borax	Grams per Liter Boric Acid	3 minutes		6 minutes		9 minutes		12 minutes		15 minutes		18 minutes		pH
		Gamma	Fog	Gamma	Fog	Gamma	Fog	Gamma	Fog	Gamma	Fog	Gamma	Fog	
2				0.41	0.13	0.58	0.16	0.72	0.20	0.82	0.23	0.91	0.25	8.5
14	2	0.31	0.10	0.60	0.15	0.78	0.22	0.91	0.28	1.03	0.35	1.10	0.38	8.9
11	5	0.26	0.07	0.50	0.14	0.66	0.19	0.79	0.20	0.90	0.30	0.97	0.33	8.7
8	8	0.23	0.07	0.39	0.09	0.56	0.13	0.70	0.16	0.83	0.18	0.92	0.20	8.3
5	11			0.30	0.05	0.45	0.11	0.61	0.12	0.70	0.15	0.80	0.16	8.0
2	14					0.36	0.06	0.50	0.09	0.59	0.10	0.67	0.14	7.8

sulfuric acid. Elon crystallizes with one-half mole of sulfuric acid per molecule so that two molecular weights of crystallized Elon (mol. wt. = 172, total weight 344) are required to neutralize one mole of the borax. Consequently, borax and Elon neutralize each other in weight ratios of 381:344, which substantiates the result obtained from a study of the alkalinities of the developer.

In these terms the borax developer formula is simplified as it actually occurs in solution. The borax and Elon, used in equal concentration (2 grams of each per liter, practically neutralize each other so that the developing solution is essentially a solution of Elon base (monomethyl para-amino phenol) and hydroquinone in a 10% solution of sodium sulfite.

The alkalinity of the developer can be increased by increasing the quantity of borax. Fig. 4 gives time-gamma curves for the regular formula with increasing concentrations of borax up to 20 grams per liter and shows graphically how the rate of development increases with an increase in borax content. If a gamma of 0.9 can be produced in 18 minutes with the regular formula, the same gamma can be obtained in 12½ minutes in a formula containing 6 grams of borax per liter; and in 9 minutes with 20 grams of borax per liter.

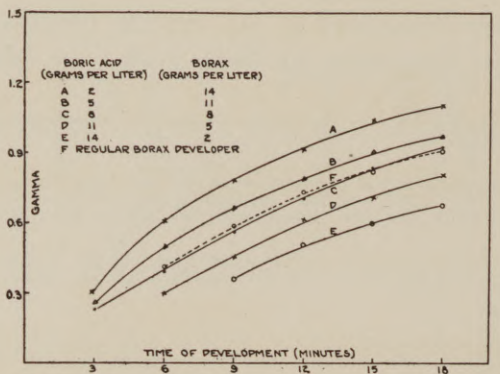


Fig. 5. Time-gamma curves for various proportions of borax and boric acid in the regular borax developer formul at 65°F. (Rack and Tank method).

A definite control of the alkalinity of the developer can be maintained by adding boric acid and extra borax to the regular borax developer formula. This combination of a weak acid and its sodium salt in the same solution produces a buffer solution, so-called because it stabilizes the alkalinity of the solution. A buffered solution has a potential resistance to chemical agencies which tend to increase or decrease the alkalinity of the developing solution. Since the rate of development changes very much with small changes in alkalinity, the buffered solution tends to stabilize the rate of development.

By using 8 grams of boric acid with 8 grams of borax in the standard formula and then increasing one at the expense of the other, so that the total quantity of the two is kept constant, the alkalinity of the solution and the rate of development can be controlled. The variations in rate of development that can be produced by this method are shown in Fig. 5. With 14 grams of boric acid and 2 grams of borax per liter, a low rate of development is obtained, while with 14 grams of borax and 2 grams of boric acid, a high rate of development is obtained. All degrees of development between these limits can be obtained by interpolating the data in Fig. 5. Neither borax nor boric acid should be used to the exclusion of the other because, if this is done, the solution loses part of its buffering action.

Table III shows the effect, on the rate of development, of changing the concentration of borax and boric acid in the borax developer. Concentrations are given in grams per liter of borax and boric acid added to a solution containing 2 grams of Elon, 5 grams of hydroquinone, and 100 grams of sodium sulfite per liter.

(3) *Effect of Addition of Potassium Bromide.*—Comparison of developers Nos. 1 to 6 (Table II) with a potassium bromide content from 0.1 to 5.0 grams per liter shows that increasing the bromide concentration decreases the amount of development, the fogging action, and the speed of the emulsion. The lowest concentration of bromide gives a slight increase in speed because the fog values are decreased without an appreciable decrease in the general development.

(4) *Effect of Variation of Sulfite Content.*—On increasig the concentration of sulfite from 25 to 100 grams per liter, the rate of development and the speed of the emulsion are slightly increased. Further additions of sulfite decrease the rate of development but the emulsion speed is not affected (Nos. 26-30, Table II). The influence of sulfite on graininess will be discussed later.

(5) *Effect of Addition of Sodium Sulfate.* — Hydrated sodium sulfate has been added to tropical developers to decrease the swelling of the gelatin and the rate of development.[12] Up to a concentration of 100 grams per liter, it decreases the rate of development without decreasing the speed of the emulsion or increasing the fogging action (Table II, Nos. 16, 17, 18). Various quantities can be added to the modified developer recommended above to further decrease its rate of development.

(6) *Effect of Addition of Hypo.*—Comparison of developers Nos. 19 and 26 (Table II) shows the effect of the addition of a small concentration of hypo to a modified borax developer. The addition of hypo decreases the rate of development and the speed of the emulsion. The effect of hypo on graininess will be discussed later.

(7) *Practical Methods of Changing the rate of Development.*—The rate of development can be increased by increasing the concentration of borax as shown in Fig. 4 and to a lesser degree by increasing the concentration of the developing agents if extra borax is added to compensate for their acidity.

The rate of development can be decreased by decreasing the quantity of developing agent, by decreasing the quantity of borax, by adding sodium sulfate, or by any combination of these three methods.

By using the boric acid-borax combination the rate of development can be controlled to produce any desired rate of development within the immediate range of that produced with the standard borax developer.

III. Effect of Age on the Borax Developer

(A) Without Use

For commercial purposes the borax developer keeps satisfactorily when mixed in large quantities and used soon after it is prepared. It was found, however, that several samples of developers gave an increased rate of development when they were tested after having been stored for several weeks. This was caused by an increase in the alkalinity of the developer. Analytical tests showed that there was no change in the concentration of the sodium sulfite and further tests are in progress to determine the cause for the change in alkalinity.

For sensitometric purposes, however, a developer is needed whose rate of development does not change with keeping.

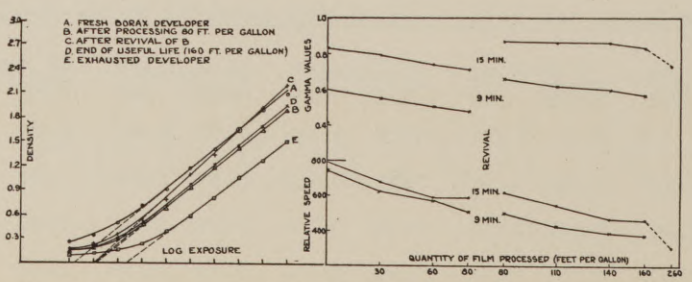
A comparative keeping tests was mare with the regular borax developer and a buffered borax developer with the following composition:

Elon	2.0 grams
Hydroquinone	5.0 grams
Sodium sulfite (desiccated)	100 grams
Borax	8.0 grams
Boric acid	8.0 grams
Water to	1 liter

The developers were stored in closed earthenware jugs and tested every week by the regular H. & D. mthods. The data obtained is recorded in Table IV. The results for any time of development show that with the regular borax developer the rate of development increased with keeping. The gamma for 12 minutes' development increased from 0.78 to 1.19 in 49 days. With the buffered developer the rate of development remained constant within the limit of error for the 49 days of keeping. For sensitometric purposes which depend upon the development factors remaining constant over a period of several weeks, the buffered borax developer is preferable to the regular formula.

The effect of passing carbon dioxide into the developer was to decrease the rate of development. The carbon dioxide hydrolyzed to give carbonic acid which decreased the alkalinity of the developer. Bubbling air through the developer increased the rate of development. This fact is not readily explained, but indicates that the quantity of

(*Continued on Page 18*)



Left, Fig. 6. Characteristic H. & D. curves for 15 minutes development made at critical points in the life of a tank of borax developer. Right, Fig. 7. Exhaustion curves for a 120-gallon tank of borax developer showing gamma and relative speed values for a development time of 9 and 15 minutes. Rack and Tank method at 65°F. in both cases.

How Bell & Howell *build*

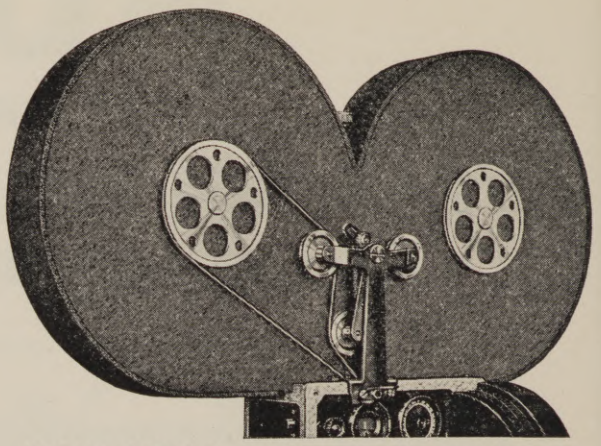
Silence into SOUND CAMERAS

Silence . . . and yet mobility!

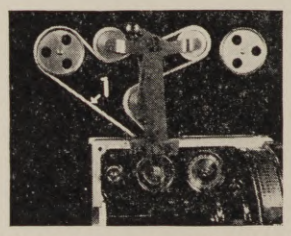
Thus the order came to Bell & Howell engineers and designers. And again there was a demonstration of that great precision and accuracy, that thorough-going engineering skill which has made Bell & Howell a by-word in nearly every major studio.

Felt linings, fiber gears, solid bronze bearings, endless fabric belts, sponge rubber coverings . . . every known method of cancelling, intercepting, and muffling mechanical noises was brought into play. The result is the Bell & Howell Standard Sound Camera, which operates within ten feet of the microphone, *without a booth,* and not the faintest click registers on the sound track.

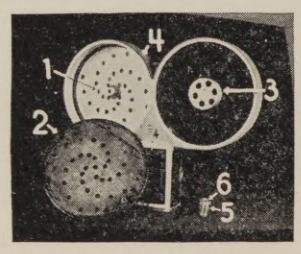
Consultations on any phase of sound-recording installations are invited.



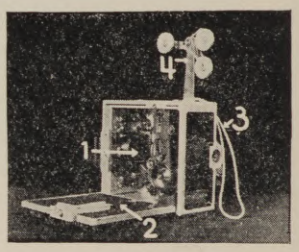
Bell & Howell 1000-ft. Sound-Proof Magazine equipped with Silent Belt Tightener that keeps uniform tension on endless fabric belt



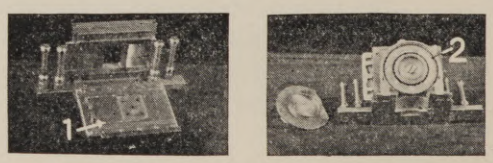
Silent Belt Tightener on Bell & Howell 400-ft. Magazine. 1. Endless fabric belt



1,000-ft. Sound-Proof Magazine shown disassembled: 1. Sound-intercepting holes drilled in back of magazine drums —2. Front of magazine with rubber cover removed—3. Three-inch spool—4. Rubber outer cover—5. Film roller— 6. Oilless film roller bearing



Speed movement of Bell & Howell camera equipped for sound work—1. Check-pawl super-speed movement—2. Felt lining of camera door—3. Endless fabric belt—4. Belt tightener

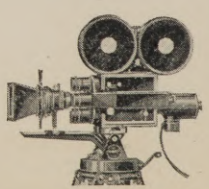


Bell & Howell check pawl super-speed movement — 1. Driving finger — 2. Formica (fiber) gear

BELL & HOWELL COMPANY

Dept. H, 1805 Larchmont Ave., Chicago, Illinois

NEW YORK, 11 W. 42ND ST. HOLLYWOOD, 6324 SANTA MONICA BLVD.
LONDON (B. & H. CO., LTD.), 320 REGENT STREET . . . . ESTABLISHED 1907



WIDE IMAGE ON STANDARD FILM

Hollywood Inventor Claims Method Devised Whereby Image Twice Present Width Can be Made on Standard Film and Projected through Standard Projector

By Captain Ralph G. Fear
President, Cinema Equipment Co., Hollywood

Wide film is an important factor in the picture world today, and several companies are experimenting with various methods. To date, the methods call for special equipment in theatres and elsewhere. Captain Fear claims only the addition of an optical unit to standard projector and camera is only requirement for his method. Due to the unusual claims by the inventor, we have had Captain Fear write his own detailed description and account.—Editor's Note.

WITHOUT doubt, the present size image in the motion picture industry is going to be changed. For years the standard dimensions of the motion picture film has been ¾ by 1 inch. This is projected on the screen through a machine which decreases the picture size to about 45/64 by 15/16 of an inch. It is then enlarged during projection. Since the advent of talking pictures the picture has been decreased in width until it is almost square. Due to this small image enormous light intensity is required under great amplification and film grain shows.

A change is surely coming. The change will be for a larger image. An image that is much wider than the standard width of the present. There are many attempts being made, and wide pictures are going to be the rule of the future.

I have devised a method which I feel is to be the outstanding one of the future. By my method I can produce a picture twice as wide as the present standard image, *and* can produce it on *standard size* film. In addition to making a picture on standard film twice as wide as the present one, the sound track on my method will be twice as long as that of the standard picture, and a stereoscopic illusion will be given that approximates the natural vision so nearly that the effect of realism is startling.

But the outstanding feature of my method, in my opinion, is the fact that while it gives a picture twice as wide as the standard, and gives a sound track twice as long, it requires no new equipment either in the laboratory, theatre or studio. Only an optical unit and an alteration in gears and sprockets need be added to a standard camera to photograph the pictures, and only an optical unit plus a change of gears need be added to a standard projecting machine to make it possible to project the wide image.

In this way an untold amount of money can be saved everyone connected with the making and showing of the pictures, for under the new methods advanced by others, every bit of equipment used from the making of the film to the showing of the finished picture would have to be changed and replaced, with a cost that conservatively would run into millions of dollars. With my system only a slight change is necessary in the camera and projector and the saving is apparent. By reason of this, producers can go into production almost immediately with my system, and will not have to wait months for new equipment.

The chief points of my new method are as follows:

1. It gives larger picture on standard film.

2. Gives a more natural picture on the screen because it more nearly approaches the normal angles seen by the human eye.

3. Gives a wider sound track for recording sound photographically on film, which improves sound record.

4. Gives a sound track approximately twice as long as the present sound track, therefore giving greater sensitivity in recording, because with present light valves the sound record for each vibration is twice as long.

5. Broadens the sound recording scope by giving increased length for recording, thus allowing recording of twice the present frequencies now recorded.

6. Can be projected through standard projectors now in use.

7. Can be printed on standard printers.

8. Standard reels used, also standard developing machines, waxing machines, polishing machines, speed and footage indicators and standard camera magazines.

9. Can be projected in any theatre having present equipment when only a slight alteration is made to projector, and standard cameras can be used with slight alteration.

10. Does not require alteration of present sound equipment.

11. Eliminates so-called "grain" in film, and no trouble with curling, together with comparative freedom from scratches.

12. All of the equipment now in use in studios, laboratories and theatres can be used with only slight alterations to cameras and projectors.

I have given the name "Fearless Super Pictures" to this new type of film, and predict that it will be one of the most revolutionary inventions of the decade.

I get my wide image on standard size film simply by using an optical system in the camera which places the image lengthwise on the film instead of across as is the present system. In this way I can get the desired width without using a wider film as the optical system is arranged so that the picture is thrown on the film to the desired width. Another optical system on the projector projects the image on the screen normally and there is the wide image from the standard size film with no added expense of new equipment.

The pictures are taken upon a standard motion picture film and are approximately .800 of an inch high and 1.813 inches long. The film track is approximately .200 of an inch wide and is on the edge of the film. The picture is photographed, either in a vertical plane by use of an optical system that turns the image through an arc of 90 degrees and places it parallel to the edge of the film, or it may be photographed directly upon the film without the use of the optical system. In the latter case the film runs horizontally past the aperture.

I have applied for patents on all phases of this new method; the method of photography, the film with the combination of a sound track and rectangular picture with the top of the picture parallel with the edge of the film; for a camera suitable for photographing these pictures; for the method of turning the picture optically from a vertical to a horizontal position for projection; and on the combination of the optical system and projector necessary for turning the picture from the vertical to the horizontal

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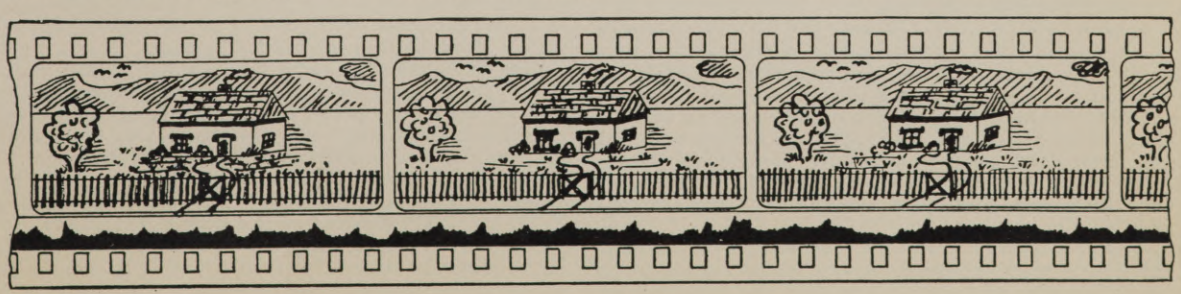


Image as photographed on film.

Fine Grain Developer

(*Continued from Page 14*)

carbon dioxide present in the air has no perceptible effect on the rate of development.

Table IV. Effect of Aging on the Regular and Buffered Borax Developer

Regular Borax Developer

Days	6 min. gamma	9 min. gamma	12 min. gamma	15 min. gamma	18 min. gamma
0	0.50	0.67	0.78	0.92	1.05
8	.53	.74	.86	.97	1.03
14	.51	.71	.89	.96	1.08
22	.60	.73	.91	1.03	1.12
28	.53	.76	.87	1.07	1.17
35	.58	.81	.95	1.05	1.15
42	.67	.92	1.01	1.10	1.24
49	.79	.99	1.19	1.43	1.45
Buffered Borax Developer					
0	0.44	0.61	0.78	0.90	1.04
8	.46	.62	.79	.94	1.01
14	.46	.62	.79	.94	1.01
22	.49	.61	.82	.95	1.03
28	.45	.61	.77	.90	1.06
35	.46	.68	.87	.99	1.08
42	.48	.67	.80	.96	1.08
49	.47	.65	.85	.98	1.08

A series of tests were made to find the effect of aeration upon the rate of development with the regular borax developer. The results are shown in Table V in terms of the gamma values for the various times of development.

Table V. Effect of Aeration on the Rate of Development

	12 min. gamma	15 min. gamma	18 min. gamma	21 min. gamma
Regular borax	0.72	0.80	0.92	0.97
Aerated for 5 hours	.81	.93	1.04	1.09
Bubbled with carbon dioxide for 4 hours	.15	.36	.47	.52

(B) With Use

(1) *The Chemistry of Development.*—(a) During development a very complex chemical reaction takes place between the silver halide in the emulsion and the developer. In the case of a negative emulsion the silver halide may be considered to consist essentially of silver bromide which reacts with a hydroquinone developer as follows:

Silver bromide + alkali + sodium sulfite + hydroquinone = Silver + sodium bromide + hydroquinone sulfonates.

Quinone is probably an important intermediate product but it reacts at once with the sulfite to give hydroquinone monosulfonate.[13] This is a developing agent and may go through the cycle again to give hydroquinone disulfonate as a final product. Elon probably gives similar reaction products because the aminophenols, of which Elon is a member, are very easily oxidized to quinone.

The by-products of development, sodium bromide, sodium iodide, and the disulfonates of hydroquinone which accumulate in the used developer have a retarding action on development. As development progresses, the supply of developing agents is therefore slowly used up and the products of development accumulate so that a point is finally reached where there is a serious drop in the rate of development and the speed of the emulsion. The quantity of film that can be processed before this occurs determines the life of the developer.

A partially exhausted developer, however, can be rejuvenated by the addition of a fresh supply of developing agents so that it can go through another period of usefulness before it becomes exhausted.

(b) Sodium sulfite is used in most developers to protect the developing agents from aerial oxidation. When the developer is exposed to the air, a small quantity of the sulfite is converted to sulfate which in this concentration has no effect upon the development process. Some sulfite is also used up in forming the hydroquinone sulfonates, but the quantity involved is relatively small so that the effective concentration of sulfite in the borax developer remains practically constant with use.

(c) Sodium sulfite is also a solvent for the silver bromide in the emulsion and forms a silver bromide-sodium sulfite complex salt which is soluble in developing solutions. This solvent action goes on as a side reaction during development and the silver complex is then slowly reduced or developed to metallic silver which settles out on the walls of the developing tank and precipitates in the developer as a gray sludge. This sludge formation is a secondary reaction which both depletes the supply of developing agents and adds more restraining products to the developer.

(2) *Effect of Use on the Rate of Development.*—The experimental developers were exhausted in a miniature system with racks holding 50 inches of motion picture film, and tanks holding one-half gallon of developer. The data on exhaustion and revival, however, which are given below were obtained with the developer under commercial working conditions in a 120-gallon tank. The life history of several of these developers was followed by H. & D. methods with special emphasis placed on the changes that occurred when the developer was revived. Fig. 6 shows H. & D. curves obtained by developing for fifteen minutes at various stages throughout the life of a 120-gallon tank of borax developer.

An exhaustion curve for another batch of developer is given in Fig. 7. The gamma values and relative speed values are plotted against the quantity of film processed per gallon.

During use, the supply of developing agents in the borax developer is gradually depleted as a result of the development process itself and the process of sludge formation so that obviously the rate of development decreases with use. Referring to Fig. 6, for a given exposure when developing for 15 minutes, the density dropped from 1.90 to 1.64 after processing 80 feet of film per gallon. It was then necessary to increase the development time to 18 minutes to produce the density of 1.90 produced originally in 15 minutes.

Within the useful life of the developer, the time of development required to produce a given degree of development increases from 25 per cent to 50 per cent.

The shape of the time-gamma curve is not changed by the use of the borax developer. A series of time-gamma curves corresponding to those in Fig. 2 was made with a developer in which 60 feet of film had been processed per gallon. The gamma values were lower because of the partial exhaustion of the developer, but the curves had the same shape as those obtained with a fresh developer.

(3) *Effect of Use on the Emulsion Speed.*—It is well known that the accumulation of alkaline bromides and iodides and developer oxidation products in a developer has the same effect as reducing the speed of the emulsion.[14] The extent to which an exhausted borax developer reduces emulsion speed was determined by plotting H. & D. curves throughout the useful life of the developer and with the spent developer after it was exhausted. The H. & D. curves obtained by developing for 15 minutes in fresh and exhausted developers are shown in Fig. 6. Curve A was made at the start and curve B after 80 feet of film had been processed per gallon. From curve B it is seen that the restraining products had the effect of removing or subtracting a constant density from both the highlights and shadows of the negative. Since the fog density, however, dropped from 0.22 to 0.14 there has been very little decrease in the effective emulsion speed (see also Fig. 7). The speed decreases to a value equal to about 60 or 70 per cent of initial value. Development beyond this point (80 feet per gallon) results in a much greater decrease in emulsion speed. Curve E indicates the condition of the developer after 200 feet of film had been processed per gallon, and shows that the film speed is only 30 per cent of its original value.

The accumulation of the alkali bromides is partially responsible for the drop in the film speed shown in curve E, but no satisfactory method is known for removing them from the developer.

Further tests were made to determine if any of the usual developer constituents could be added to bring back the speed of the emulsion to its original value in the fresh developer. Borax, Elon, hydroquinone, sodium hydroxide, sodium carbonate, and potassium carbonate were added to a developer in which 40 feet of motion picture film per gallon had been processed. Most of them gave no practical increase in film speed and some of them gave a decrease in speed. Four grams of borax per liter added to an exhausted developer increased the speed of the film by about 50 per cent. Further tests are in progress to determine if there is a practical method of increasing the life of the developer.

(4) *Effect of Use on the Fogging Properties.*—The table in Fig. 1 gives the fog values for the fresh borax developer over a wide range of degrees of development. With use, the amount of fog decreases for a constant degree of development on account of the accumulation of bromide ions liberated by the development process. A fog value of 0.20 for a given degree of development in a fresh developer drops to 0.12 by the time 80 feet of motion picture film have been processed per gallon.

The above values are given for fresh film. Under working conditions the fog depends upon a number of factors which include: (1) the age of the film; (2) the amount of light scatter during exposure in the camera; and (3) the amount of exposure which the film may receive during handling in the darkroom. The fog density obtained in actual practice includes that caused by the developer plus the fog accumulated in the process of handling.

(C) Revival of the Borax Developer

The equation representing the chemical reactions occurring during development shows that the developing agents, the alkali and sodium sulfite, are used up in the process of development, although

(*Continued on Page 46*)

A. B. C. of Sound

(*Continued from Page 7*)

sists of an evacuated bulb containing a filament, a grid and a plate. The filament, when heated, discharges electrons which are, as we know, infinitesimally small particles of negative electricity, the escape of which from the metal is made easier and more pronounced with the increase of temperature of the metal itself.

Under normal circumstances, after a certain number of electrons have left the filament this becomes positively charged and it acquires a tendency to draw the escaped electrons back again to it. However, if a plate is placed at close proximity to the filament and this plate is charged with positive electricity, with respect to the filament, by means of a battery, commonly called the B battery, a certain proportion of the electrons will be attracted to the positively charged plate and constitute a current of electricity between filament and plate. If the voltage of the B battery is increased, the flow of electrons may be so increased to the point where practically all of the electrons emitted by the filament will flow towards the plate.

On the other hand, if the current of the plate is maintained constant and the emission of electrons from the filament is increased through an increase in its temperature, the current of the plate will be increased to a certain point after which it remains practically constant, even though the temperature of the filament is still increased. This is due to the fact that the flow of the negative electrons through the tube acts as a charge of negative electricity which neutralizes the field produced by the positive plate.

This charge of negative electricity, if neutralized, will produce an increase in the plate current. On the other hand, if the charge is increased by any suitable means the current of the plate will, of necessity, decrease.

These effects are brought about by placing a grid between the plate and the filament. The grid may be either a fine wire mesh or a thin perforated metal leaf and the electrons emitted by the heated filament have to pass through the small orifices of the grid to reach the plate. When the filament is electrically charged it will have a stronger effect upon the electrons emitted by the filament than the plate because of its greater proximity to the filament itself.

All the electrons which pass through the meshes of the grid are carried to the plate, but their number depends upon the charge of the grid and upon that of the plate. In other words, it depends upon their voltage. It is obvious that only a small change in the voltage of the grid will have as great an effect on the flow of electrons than a much greater change in the voltage of the plate.

The ratio of the change of plate voltage corresponding to a change of 1 volt in the grid is called "The Amplification Factor of the Tube". If the change of plate voltage is applied to the grid of a second similar electron tube, the process is repeated and can be continued until the desired total voltage amplification is obtained.

Now when an electric current is produced by a microphone and through the action of the sound waves striking its diaphragm, its strength is necessarily very limited, but if this current is submitted to the action of an electron tube, it will be sufficiently amplified that it can be carried at a distance to a system of other amplifying tubes, which will increase its strength sufficiently to actuate the light valves of the recording apparatuses, or the wax recording stylus.

Upon the above principles are based the sound *recording* systems used today in America, and which are divided in two very distinct classes. The recording on a wax disc and the recording on film sensitive to light.

Of the latter system we may mention the two classes, the "Variable Area" and the "Variable Density". In the first the amplified, modulated current of the microphone sets in vibration a mirror in accordance with the modulation of the current. A constant source of light is reflected by this mirror upon a slit conveniently placed and the image of which is brought to a focus upon the film. The vibration of the mirror varies the area of illumination of the slit and, therefore, the area of illumination affecting the film.

In the variable density system the modulated current from the microphone either varies the intensity of illumination of a glow lamp or varies the distance between two metallic ribbons which

(*Continued on Page 46*)

"KLIEGLIGHTS" FOR TALKIES

Company Whose Name Is As Widely Known As Movies, Offers Brilliant Array of Lights For Sound Work.

THE advent of "talking movies" with its sensitive sound-recording instruments, imposing a restriction for absolute silence in the studio; and the demand for greater economy in the lighting of studio sets—has resulted in the development of a new form of Kleiglights for motion picture photography, in which high-candle-power incandescent lamps are used for the light source. These new Kleigs furnish brilliant, evenly diffused light high in actinic qualities, permitting photography with clearness of detail, full color values, sharp definition, and freedom from sound interference. They are absolutely noiseless in operation and cause no disturbance in the recording of sound photography. They are efficient in light control and utilization; afford complete command over the direction, diffusion, and divergence of the light beam; are light in weight; can be easily and quickly handled; operate on the service line, whether A.C. or D.C.; and introduce economies in current consumption, production time, and labor requirements. They are modern in every respect, adapted to present-day studio conditions, and furnish the kind and quality of light required in this new era of motion picture photography.

KLIEG-SUN (No. 1144B) is a long beam, high intensity floodlight for projecting a strong, well-defined, evenly-diffused beam of light a considerable distance—covering a restricted area; used especially for general lighting of deep sets, producing sunlight effects, spotting-out, modelling, and for accentuating main points of interest; accommodates 2000-, 5000-, and 10,000-watt G type Mazda lamps. Projector consists of a cylindrical lamp housing containing a receptacle, reflecting mirror and adjustable lens; mounted on a telescopic standard; set on a base fitted with ball-bearing rubber-tired casters; constructed as to minimize weight; designed to allow free and easy movements, adjustments in height, and to roll easily over the floor. It is well ventilated to insure comparatively cool operation—thus prolonging the life of the lamps; and slide grooves on the front permit the use of a diffusing screen.

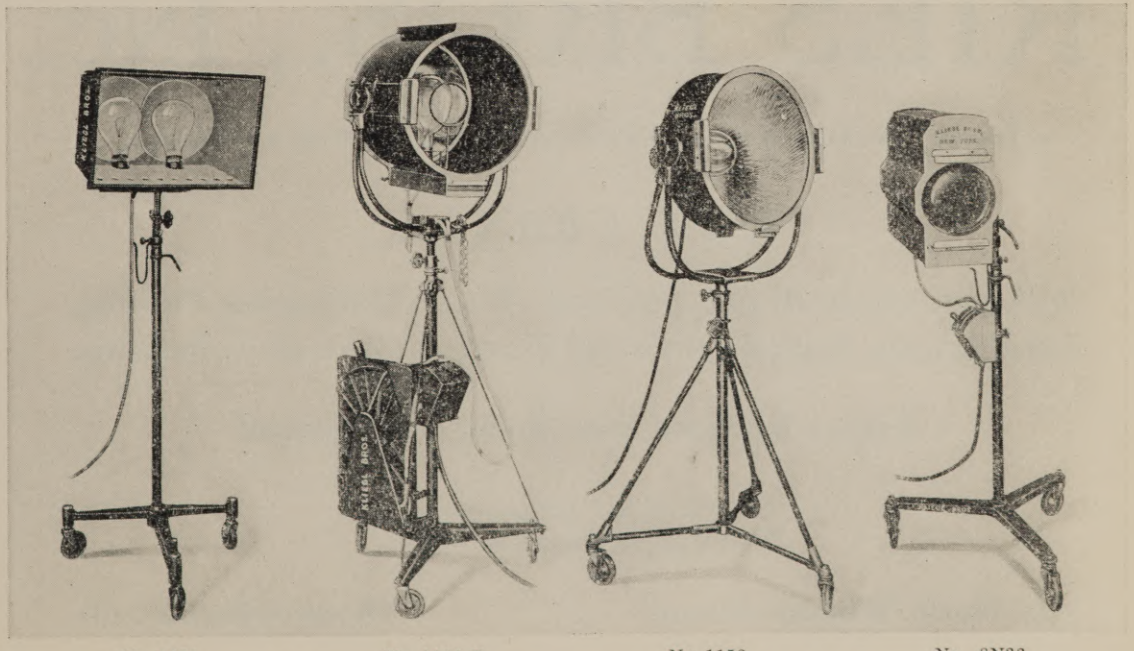
Receptacle for the lamp is mounted on a traveling base, controlled by a small lever at the rear of the housing. It moves along the reflector axis, which allows focusing the lens and regulating its beam spread from eight to approximately thirty degrees.

An adapter is furnished to fit the lamp receptacle, permitting the use of the smaller-sized lamps than that for which the unit is designed. The adapter serves to correctly position the lamp filament in the optical axis of the reflector.

A heat-resisting, mirrored-glass parabolic reflector, in the rear of the housing, back of the lamp, reflects the light, increases the efficiency, and facilitates control of the light beam.

A six-inch plano-convex condensing lens is set in front of the bulb—mounted on a movable carriage, controlled by a small lever at the rear of the housing, equalizes the intensity of the luminous rays and eliminates "ghosts" or dark center, which would otherwise be present when the beam is spread.

Mounting is so devised that the lamp can be balanced in any position; light beam projected in any direction; lamp raised or lowered within a (*Continued on Page 37*)



No. 1150 No. 1144-B No. 1153 No. 8N22

New Incandescent Klieglights for Motion Picture Photography.

Survey of Theatre Screen and Projection Machine Aperture Proportions Planned

AN IMMEDIATE nation-wide survey of motion picture theatre screen and projection machine aperture proportions will be conducted under the auspices of the Academy of Motion Picture Arts and Sciences in cooperation with other motion picture technical organizations.

Representatives of the Society of Motion Picture Engineers, The American Society of Cinematographers and the American Projejction Society met with the executive committee of the Academy Technicians' Branch Wednesday, July 17, in the Academy rooms. It was decided to hold the first of a series of joint meetings of the four organizations August 15 for action on problems affecting both the production studios and the theatres in connection with talking pictures.

Steps toward securing a standard screen proportion for theatres equipped to use both disc and sound on film methods will be taken on the basis of the national survey. Other problems which will be attacked by the studio and theatre technicians jointly include volume control in the theatre and changeover.

John F. Seitz, president of The American Society of Cinematographers and member of the Academy, was named for chairman of the first joint meeting. The committee in charge of the program is as follows: C. E. Dunning, president of the Hollywood branch of the Society of Motion Picture Engineers; Albert Feinstein, board member of the Hollywood chapter, American Projection Society; John Arnold of The American Society of Cinematographers; H. Keith Weeks, executive manager of Fox Movietone, representing the Academy, and Frank Woods, secretary of the Academy.

"Theatres equipped for both disc and film sound projection are confronted with a problem on the shape of their screen," Mr. Woods points out. "The sound track makes the frame more nearly square. When the aperture in the projection machine is adjusted to this the picture does not occupy all of the space on the oblong screen. Smaller theatres many times ignore all readjustment and the picture appears on the screen with a blank space down the side. If a drape is hung over one side of the screen it has to be taken away when a silent or sound on disc picture is run. A practice has grown up for the projecitonist in some theatres to mask off enough of the top and bottom of the aperture to make it the usual oblong proportion. Then he enlarges the picture to fill the whole screen by putting on a different lens. Not preparing for these conditions some studios make closeups and plan their composition in general to fill the whole frame. The result is that in many theatres the top of a character's head or his feet may be cut off in the picture as it shows on the screen.

Wm. Horsley Laboratories Handling Big Volume

With equipment installed that enables the handling of 2,700 feet of negative per hour and 11,000 feet of positive film per hour and with equipment to care for sound film in 1000-foot rolls, the William Horsley Laboratories, 6060 Sunset Boulevard, Hollywood, claims the honor of being the biggest independent film laboratory on the West Coast, and announces they are prepared to take an unlimited amount of independent business.

William Horsley, head of the laboratories, declares that he expects to secure the bulk of the "Independent" business during the coming year, as there is no other independent laboratory that can take care of the immense volume of work Horsley can handle.

Horsley also is prepared to treat film with his special "filmcote" process which he claims protects the emulsion side of the film from abrasions and scratches, seals moisture within the film, eliminates necessity of waxing, adds strength, makes possible the cleaning of oil spots and dirt from emulsion and affords great protection to the sound track.

Few persons realize that the Horsley Laboratories is one of the biggest 16 m. m. laboratories in the country. Last year a total of more than 5,000,000 feet of 16 m. m. film was handled in these laboratories. This business came from all sections of the United States. The laboratory makes a specialty of reduction printing, and many firms putting out 16 m. m. releases made from standard films have their work done by Horsley. The coming year, Horsley expects will be the biggest year in his history, and he confidentally looks forward to securing most of the independent commercial business now that he is prepared to take on unlimited footage of sound work.

Cinema Equipment Co. Announces New Silent Movement for Mitchell Camera.

The slogan of Cinema Equipment Co. is "Watch For New Fearless Products". Due to the activities of moving and getting settled in their new quarters at 7160 Santa Monica Blvd., they failed to announce a new product for the month of June.

However, during July, Ralph G. Fear, head of the organization, announced the new Fearless Silent Movement for Mitchell Cameras. Another announcement is that of silencing Mitchell cameras, adapting them for sound work outside of a booth.

These new products swell the total of special camera devices to the number of fourteen—-and new ones being announced each month.

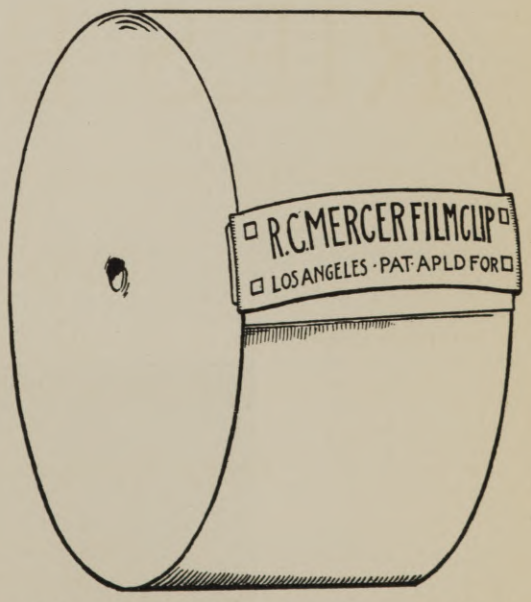
Among the Fearless products are the Simplex Movement for Bell & Howell and Mitchell; Camera Trip for Bell & Howell and Mitchell; Standard Clutch for Bell & Howell; R. C. A. Clutch for Mitchell; Motor Adapter, which adapts Standard Clutch to any Mitchell; Re-building and silencing of Bell & Howell and Mitchell cameras, which adapts them to any ordinary sound production outside of a booth—and many others.

One of the many Fearless devices is the camera Trip for either Bell & Howell or Mitchell. This Trip, when used in conjunction with the Fearless Automatic Clutch, will stop the camera instantly in the event of a film buckle. This de-clutching and stopping of camera is accomplished in the space of a half dozen frames.

Gordon Pollock, speaking of the Fearless Trip and Clutch recently installed on his camera says, "I feel that your Trip and Clutch are as necessary as camera insurance. Their cost is saved many times over in the event of a film buckle. They also prevent an enormous wastage of film by enabling the cameraman to disengage his camera instantly at the end of each take."

An entire building has been taken over by the Cinema Equipment Co. at 7160 Santa Monica Blvd. and equipped with precision machinery installed in a structure comprising some 7,000 square feet of floor space. Besides the factory proper, there is a drafting room, stock room, store rooms, and several offices.

With the increased facilities, the company announces it is now in a position to catch up with back orders and to meet the increasing demand for its products, which in its older quarters it was unable to do.

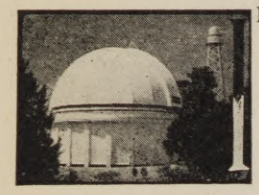


One of the most useful bits of equipment that has been devised for the handlers of film in many months is a film clip, shown above. This clip takes the place of the old rubber band which was used to hold rolls of film intact in the cutting room. This new clip, invented by R. C. Mercer, of 4241½ Normal Avenue, Los Angeles, is slipped on the roll and holds it firmly. The film cannot be scratched by the clip as it is raised slightly. For laboratory and cutting room, and for Amateurs, this clip should be a boon.

PHOTOGRAPHIC ASTRONOMY

An Unusual Paper On An Interesting Topic—Presented at the Spring Meeting of the S. M. P. E., New York City, May 6-9, 1929

By LESLIE E. CUFFE



IN PRESENTING this paper I wish you all to thoroughly understand that I am not an Astronomer, in fact I have never given it much thought until a Mr. Charles F. McManus came to me with several pages of data he had secured and worked into a very technical way dealing with Astronomy and asked me to read it over and let him know if there was any possible picture material in it. I searted to read but before very long I found myself millionsof miles away from this little earth of ours and very little chance of getting closer as I read further.

Leslie E. Cuffe

This struck me as being a great thing. Imagine in a few feet of film being able to take an audience out into space through great planets, star clouds, great gaseous regions, and into universes so great that this little earth and Sun and a few planets we see and feel about us become insignificant as compared to these enormous universes. With this thought in view I took all this material and grouped into it what I thought would make four very interesting pictures, building around each group sufficient story and travel to make them also interesting to the untechnical mind.

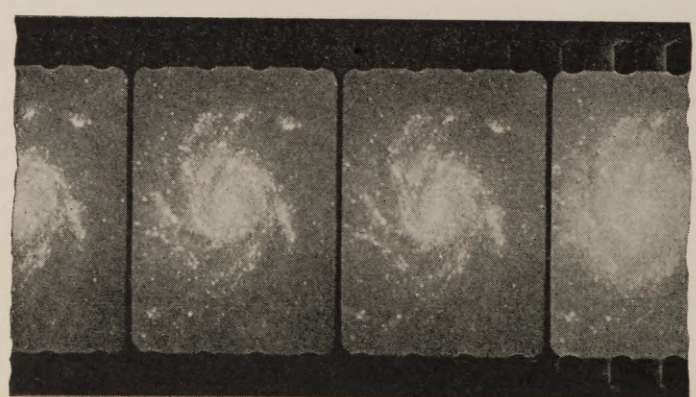
The first picture I titled "Mt. Wilson" and dealt more or less with the different telescopes, their differences in magnification as compared on a given star and a few random shots of the heavens showing the great globular clusters and cepheids, some of the most remote objects of the entire heavens. In the second picture, which is titled "Our Solar System." I dealt entirely with our Sun and its eight planets all of which are in close proximity to our earth. However, these planets of ours, due to their closeness and the great distance we (our Solar system) are from the rest of the universes, do not make very spectacular shots due to the fact that when the telescope of such great magnitude is focused on such a close object to objects in the regions behind and beyond these plaanets are so remote that the plain of focus does not pick them up. The third picture I titled "Our Universe" and deals entirely with the closer nebulous clusters of Star Clouds that comprise "Our Universe" and are not as remote as the objects in the great Galaxy. In the fourth and last grouping which is titled "The Galactic System" we take you out into Universes millions of light years from this earth of ours and bring you close to these enormous Universes whose light alone traveling at the tremendous speed of six trillion miles per year has taken over a million years to reach this small earth of ours. This we have captured and photographed, and brought to the screen one of the most incredible sights the human eye has ever or probably ever will witness. I am now going to try and explain some of the difficulties we encountered and overcame in the making of these pictures.

There are many obstacles which present themselves that heretofore have not been encountered in the photographing of motion pictures. For example, when our camera was placed in the telescope and the telescope focused on a given object we immediately encountered on time exposure eight motions that had to be corrected; for, in the relation of our camera and the object being photographed, that is, the earth is constantly revolving on its axis and traveling along its orbit, while its poles are constantly tipping and revolving in the fashion of a top that is losing its speed and starting to slow down. At the same time the Sun is traveling through its orbit, and the object we are photographing is revolving and going through space on its orbit. Therefore, when all these motions are taken into consideration there is a constant changing and displacement of this earth in relation to any object in the Heavens which we may be photographing. To offset all these motions that are encountered in relation to this earth and the various objects in the heavens, these enormous telescopes are all controlled electrically and by clockwork so that over any given period of time the same position can be maintained of any object in the heavens after the telescope is once set by the professor who calculates it mathematically.

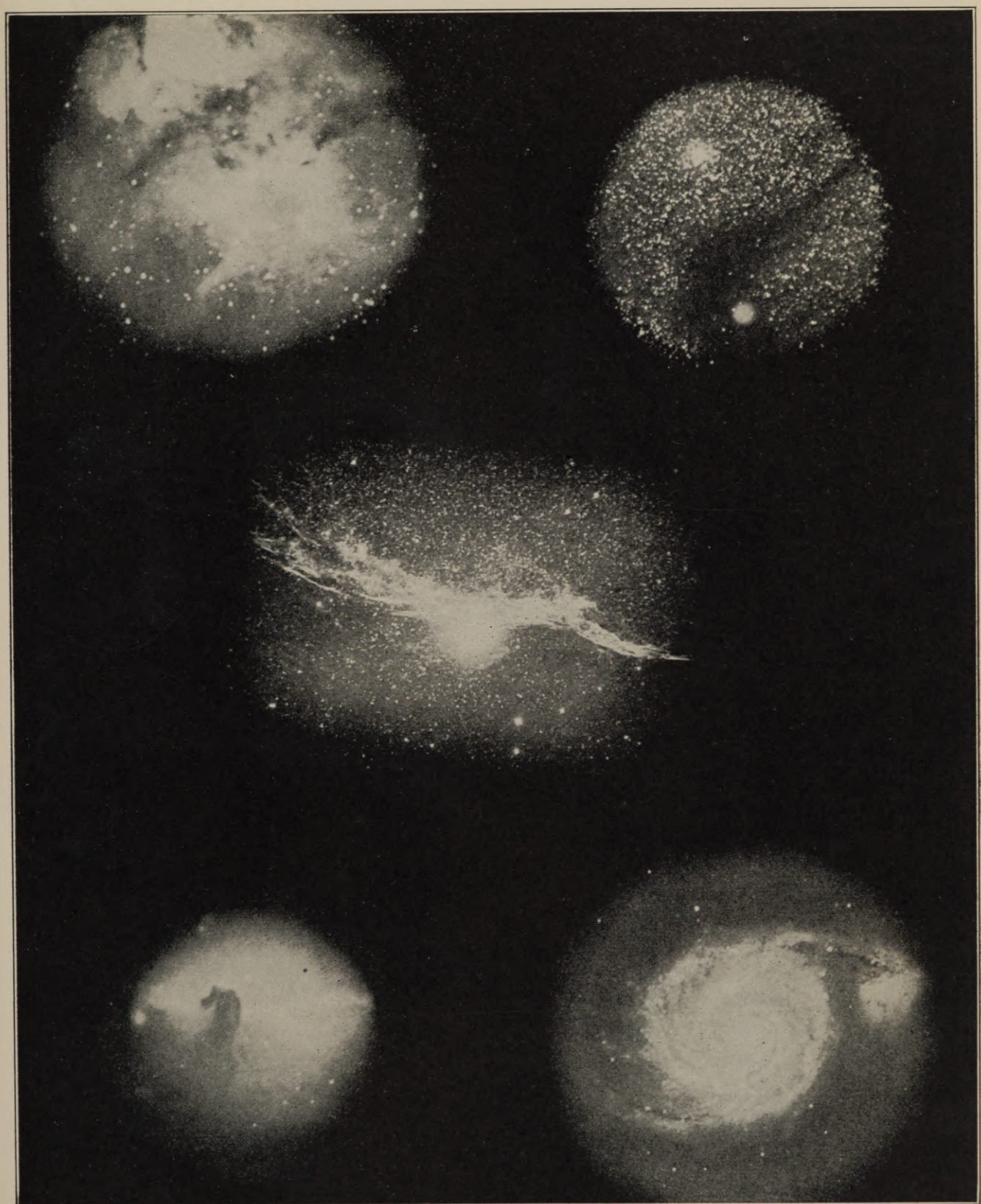
The next difficulty we ran into was the exposure necessary for the different planets. Nebulae, Star Clouds, and Universes we had to photograph. Each object had to be tested individually before actual shooting of the camera to determine the time exposure necessary per fram of motion picture film. This alone took considerable time when we take into consideration that our photographing time exposure per frame on the Nebulous Clusters, Illuminous Gasses, Dependant and independant groups of Suns and their surrounding worlds existing several thousands of light years in the central part of the Galactic System took exposures from three hours and fifteen minutes to four hours per frame. Or, we might say the average exposure was three and a half hours per frame. The Sun we photographed at normal exposure. The moon which we photographed when full to get the maximum light volume took 17 minutes exposure per frame. The planets surrounding our Sun varied directly in relation to their distance and the color of light being given off from them; for instance, Mars which has a red glow and photographs fairly fast as compared to Uranus which has a pale green glow. Mercury is one of the hardest of our planets to photograph, due to the fact that it lies in a path between us (the Earth) and the Sun, and the light from the Sun can only be overcome at certain seasons and times. The other planets, except Neptune which has a pale blue glow, photograph fairly fast. However this color value of Neptune is offset by the tremendous distance it is from the Earth.

It was necessary to use the Hydrogen filter in all our photographing, as we found this was the only filter that would photograph through the gasses, atmosphere and water vapor which surrounded a lot of the objects we were photographing.

Our process of photographing the heavens which we have recorded and incidentally are the only authentic records on motion picture film of these different bodies, took over a period of fourteen months, working every night through the different telescopes on Mt. Wilson, California, and was made possible only by the fine cooperation that was given us by the Carnegie Institute of Washington, D. C., and the untiring efforts of Dr. Adams, Professor Joy, and Professor Ellerman, of the Mt. Wilson Observatory staff.

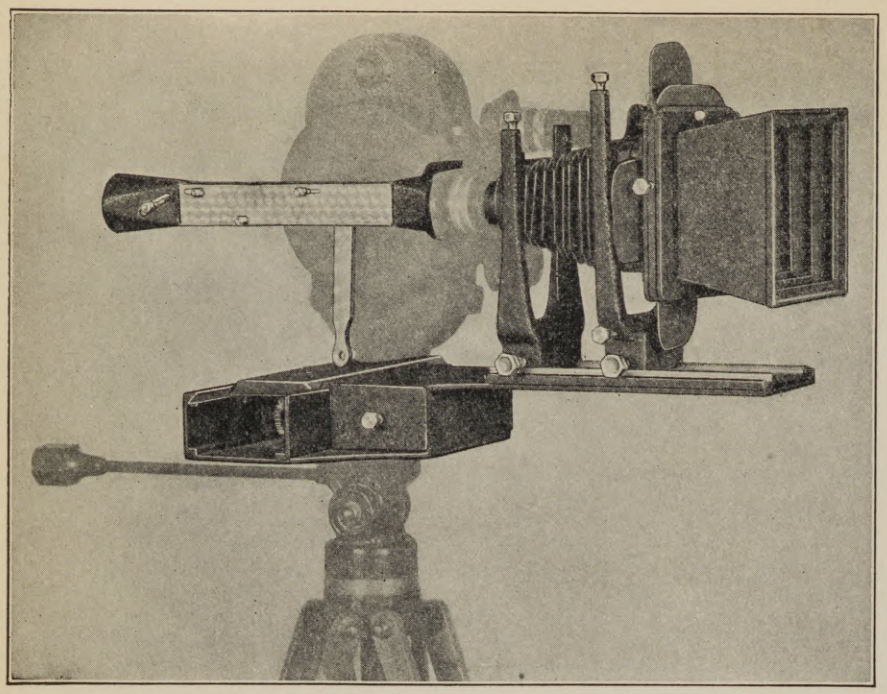


View of a spiral nebula throwing off material which condenses to form new worlds



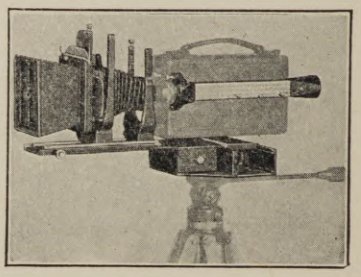
Planetary Wonders Viewed Through the Camera

Upper left is a globular cluster which is part of the Milky Way, a stellar Universe within itself, 30 million times larger than our Sun. Upper right is a cluster of variable Cepheids. Center is Cyganus Constellation, a filamentary Nebula about 600 light years from the Earth. Lower left is Orion, known as "Celestial Sea Horse," never seen by the naked eye. Lower right is Canes Venatici, it is throwing off material for new worlds.



Heinz Micro-Focus-Meter and Matte Box attached to Bell & Howell Filmo 70 with triple lense turret

Focus and exposure instantly indicated with the Micro-Focus-Meter



Eastman Cine Kodak equipped with Micro-Focus-Meter and Heinz Matte Box

Stop . . .

feeling sorry for the amateur . . . he gets good pictures too with these three new devices

HE HAS SAID GOOD BYE to "Amateur Fuzz" and has substituted sharp focus and correct exposure in EVERY PICTURE . . . plus all varieties of titles SHOT AS HE TAKES HIS PICTURES . . . plus all the professional tricks he cares to use.

These three attachments place the amateur on a par with the best equipped camera men in the business. Here is what they will do—

1 **HEINZ Micro-Focus-Meter** gives exact focus and correct exposure with any 16mm camera having a focusing mount lense.

2 **HEINZ Matte Box** (with Micro-Focus-Meter) complete in every detail, movable iris, horizontal and vertical dividers, filter holder and universal adjustment to secure any desired effect.

3 **HEINZ Title Hood** permits you to shoot your titles as you take your picture with all the trick effects. A 16mm necessity.

Ask your nearest dealer for a demonstration or send us his name if he has not yet received his floor samples. You will be delighted with the perfect workmanship and excellent materials used in the manufacture of all Heinz devices. They will greatly increase the professional use of small cameras as well as raising the standards of all amateur films made with their aid.

Micro-Focus-Meter, $40.00 Matte Box with Micro-Focus-Meter, $99.50 Title Hood, $23.75

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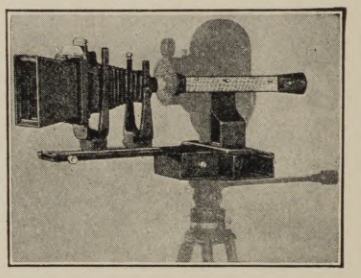
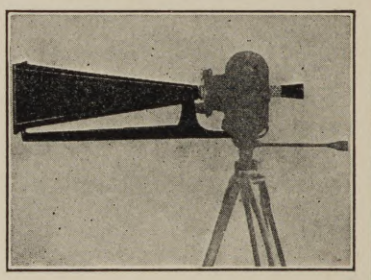
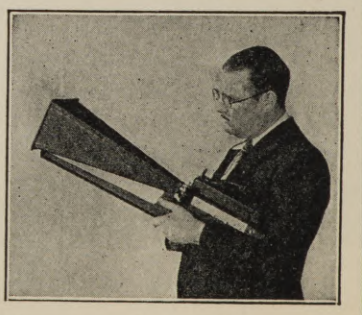
1361 South Flower Street Los Angeles, Calif.



These devices are all equally adaptable to a Victor or any other camera



Heinz Title Hood in place with Bell & Howell on tripod



The operator above is shooting a title with the Heinz Title Hood

By WM. STULL, *A. S. C.*

Amateurs and Novices

IN ALMOST all sports there are recognized three great classes: novices, amateurs, and professionals. No one would dream of classing Joe Smith, who just 'took up golf' last month, with Bobby Jones; or Susie Blake, the tennis novice, with Helen Wills—yet when it comes to photography in any form the world does that very thing, without thought of its inconsistency. One is either an amateur—a blundering novice, or a professional —and perfect.

This is very flattering to the professional, but gravely unjust to the advanced amateurs who have by patient study so perfected their art that they could take place beside the greatest of professionals, if they chose, but prefer to follow their art merely for the love of it rather than for profit. They are the true amateurs, distinct alike from professional and novice, and worthy of being recognized as such.

If there is any one term more applicable than others to describe the photographic novitiate, that term is "snapshotters," for it sums up in a word all that they have yet learned about photography. They are the ones who have not yet passed the "you-press-the-button-we-do-the-rest" stage—the ones who have not yet become conscious of the vast, unexplored world of new experiences awaiting them in the realm of true amateurism.

Probably the first thing that indicates the beginning of the evolution from snapshotter to amateur is the growing attention to little details of technique; the birth of a spirit of inquiry; the conscious expenditure of thought on the business of taking pictures—the change from a picture-*taker* to a picture-*maker*. And as this expenditure of thought increases, so also the individual's artistic stature increases. As the individual grows artistically, technique grows to mean more and more to him. It is no longer a set of dull rules and observances to hinder him, but a living, vibrant aid in perfect artistic expression. Little things, once hurriedly passed over—correct exposure, considered composition, better-chosen subjects, interesting action, novel angles—a myriad of small technical precautions that once seemed foolish and useless, now become vitally important tools for the maker of pictures, whether they be still or moving.

Use A Tripod

If genius consists in a capacity for taking pains, surely, too, success in art or science lies in a willingness to remember details. For instance, there is the tripod. To the novice, who still remembers that he paid for a *hand*-camera, a tripod seems merely a useless bother and expense, but to the advancing amateur it means security—a necessity, not an accessory. Not even the best of cinemachinery can give a steady picture from an unsteady support—and not even the best of humans can rival the physical firmness of a $5 tripod. Serious amateur still-photographers long ago learned that though hand-cameras work well when hand-held, they work better and surer from the firm support of a tripod. Most of them would as soon leave filters or film behind as forget their tripod. Press photographers, whose livelihood depends on the constant delivery of unfailing results, almost always pack a tripod along with their ubiquitous Graphics and Deckrullos. They have to travel light—but not so light as to dispense with a tripod! Why, then, should the cine amateur, equally desirous of sure, vibration-free results, feel himself above using a tripod?

Proper Panning

This question of tripods brings to mind also the question of proper panning. Recently the head of one of Los Angeles' largest cine departments said to me, "The worst fault of 90% of the work that goes through our plant is bad panning. Most amateurs use their cameras as if they were machine guns—jerk them around hither and yon as though they were spraying a rival gang with bullets. You can imagine the result on the screen, can't you? A meaningless, blurry jumble of scene, figures and what not—at best, hard on the eyes, and at worst a dizzy monstrosity. How much trouble, regret, and film they'd save if they'd only stop and think before shooting! The eye perceives the screened image vastly slower than it does the actual scene: they should keep this in mind, and allow for it—pan *slowly*—pan even *slower* than what they *feel* is *too slow*, for the eye and imagination conspire to trick the mind. *And the pan must be smooth!* A jerky pan is almost as bad as an overfast one.

"Pans add interest to a scene, but they must be carefully done, or they are better not attempted. For practical use, it's a good idea to break a pan up a bit: usually there are two or three objects of paramount importance in any scene calling for a pan; concentrate on them—deliberately focus the attention on them by stopping the panning movement when the first is central, holding the camera fixed on it for several feet, then move on *smoothly* and *slowly* to the next, and so on." This sounds like a contradictory statement, but it isn't. The eye ordinarily moves just that way. Look up from this page, and glance around the room. If you consciously *see* anything, and analyze your eye-movements in so doing, you will find that you look first at some object, say on your left, then move smoothly to something a bit on the right, stop, perceive it, move on to something a little further on, and so on until you've completed the circle. We read the same way: a few words, (how many depends on the individual angle of vision), then the next few, and so on. Scientists say that this is because the eye is practically blind while in motion: it must stop and focus on some definite object before it can transmit a clear picture to the brain. The camera is much the same, but it records slow, smooth pans better than the eye does. Thus a slow, smooth pan is cinematically satisfactory, but as the final appeal is to the human eye, it is better to pan as the eye does. This general principle is borne out in studio practice, for important action almost never occurs during a camera-movement except when the movement is such that the characters are kept in practically unchanged relation to the lens, as in follow-shots. This, by the way, gives a hint as to why the rapid pans of the Akeley camera are not disagreeable: the pan is held absolutely steady by the gyro apparatus, and, in addition, the subject being followed appears practically fixed against the rapidly-moving, indistinct background.

About Reflectors

While on the subject of professional practice, a word about reflectors isn't out of place. Anyone who has ever seen a professional company shooting exteriors remembers the abundance of reflectors used. They are as vital to out-of-door cinematography as rudder and ailerons to an airplane, for they are the means by which the cinematographer controls the sunlight to paint the picture as he wishes it. They can be no less useful to amateurs—especially to Kodacolor users, to whom strong, even lighting is so important. Yet even

(*Continued on Page 43*)

Kodacolor Processing Stations

FOR the benefit of our readers who may be travelling abroad and for our many subscribers in foreign countries, we print herewith a complete list of stations in foreign countries where Kodacolor film may be processed. The Eastman Company announces that additional foreign stations are being installed as rapidly as possible. Those already equipped follow:

London: Kodak, Ltd., Kingsway, W. C. 2.
Paris: Kodak Pathe, Place Vendome, 28.
Berlin: Kodak Aktiengesellschaft, Leipzigerstrasse 114.
Batavia, Java, Kodak, Ltd., 8 Noordwijk 38, Waltevreden.
Singapore: Kodak, Ltd., 8 Battery Road.
Melbourne: Kodak Australasia Pty., Ltd., 284 Collins St.
Calcutta: Kodak, Ltd., 17 Park St.
Cape Town: Kodak (S. A.) Ltd., 38 Adderley St.
Honolulu: Kodak Hawaii, Ltd., 817 Alakea St.
Havana: Kodak Cubana, Ltd., Zenea 236.
Panama City: Kodak Panama, Ltd., Edificio Grebmar, Avenue Pablo Arosemena.
Lima: Kodak Peruana, Ltd., Divorciadas 650.

In the United States and Canada, Kodacolor film is being processed at:

Rochester: Eastman Kodak Company.
Chicago: Eastman Kodak Company, 1727 Indiana Ave.
San Francisco: Cine-Kodak Service, Inc., 318 West 8th St.
Toronto: Canadian Kodak Co., Ltd., 66 King St. West.

It is advisable to have your Kodacolor film processed as soon as possible after exposure, so the foreign list printed above will, we hope, prove of benefit.

Watch Your Fingers

WHEN making an exposure always be careful not to allow the fingers or any other solid object to come before the lens of your camera. Under ordinary conditions this probably will not occur, but under stress of excitement where quick action is called for, be careful. The finder will not warn you, and you may discover later that a choice scene has been spoiled. Making movies is like hunting—calmness at all times is necessary for success.

INFORMATION FOR AMATEURS

Amateurs—Send your problems to this department and have them solved by the world's finest cinematographers—the members of the A. S. C. This is your department. Our aim is SERVICE. Write us and find your answers here.

Question from L. R., St. Louis: In your July isues you answered a question regarding gauze-mattes. Is there any definite distance from the lens at which such mattes or vignettes should be placed?

Ans.: No. The distance can be altered to fit the subject and effect desired, but it should be remembered that the closer to the lens the gauze or mask is, the more diffuse the effect, and the more diffuse the outline of the iris or other vignette. Conversely, the farther from the lens, the sharper the outline.

Question from H. H., Cleveland: Is there any danger of fires with large quantities of 16mm. film if stored in the home?

Ans: No. While the 'safety-stock' upon which all 16mm. film is coated is of course slightly combustible, it is no more so than the paper upon which ordinary kodak prints are made. Thus if it is kept—as it should be for best preservation—in metal cans, particularly the metal humidor-cans now available, there is no danger. The best proof of that is that all the insurance companies recognize the safety of such film, and approve of it. It is not coated on the highly inflammable stock that X-ray films are on, so there is no danger of domestic repetitions of the recent hospital tragedies caused by the explosions of X-ray films.

Question from H. G., Los Angeles: What is the best position for a color-filter?

Ans.: Theoretically, it should be as near as possible to the focal-plane (i. e. the film or plate). Generally, this is best done by putting it behind the lens; but often—especially in 16mm. cinema cameras—this is not possible. Hence the filter should be mounted in front of the lens, as close to the lens as possible, and always protected from the direct rays of the sun. In Kodacolor work, the compensating filter should be kept as close to the lens as possible or the results will be very inferior.

Question from L. D., San Diego: When in doubt as to the correct exposure for a given subject, should I over- or under-expose?

Ans.: When using negative film, and having a print made from that—as in ordinary still photography, or in using 35mm. apparatus—the old rule holds good: "expose for the shadows, and the high-lights will take care of themselves", and if in doubt, overexpose a bit. But when using the standard 16mm. *reversal* film, the reverse holds true: underexpose a little, for that gives a better result on the screen with this kind of film.

Question from M. S., Chicago: When should a neutral density filter be used in making Kodacolor pictures?

Ans.: The neutral density filter should be used where the light is exceptionally bright, such as distant sea or sky scenes, all beach scenes and distant landscapes and mountains. Full-length or half-length portraits, if the subject is dressed in white or light colored costume also require this filter. On another page is a reprint of some important suggestions relative to using Kodacolor, reprinted from the "Cine-Kodak News". Read it carefully and you should profit by it.

Question from S. K., Brooklyn: This gentleman wishes advice as to how to "break into" the professional cinematographic field. He explains that he has taken a course at an excellent school of photography, that he has mastered the projectionist's art and has done considerable news reel work.

Ans.: Because of the large number of letters received by the editor asking this same advice I will answer in a general way here, and will write you personally in greater detail shortly.

In the first place, it is a difficult task to become a cinematographer in the great field of motion picture making, and unless a man is willing to wait a long time and struggle along at perhaps very menial tasks, he had better decide on some other profession. The field is pretty well filled and you will find many men ahead of you with a lot of real experience waiting their turn. It is almost next to impossible for a beginner, unless he knows someone in authority, to get a start on a camera unit. My suggestion is to try to get into a laboratory at a studio, and after working there for some time, always with eyes open to opportunity, then make your bid for a place as an assistant and if you get it, work hard and be patient. It requires years, most of the time. However, you might find a way to "hook on" with a news-reel organization and from this get the chance eventually. But getting into a laboratory is the best advice I can give.

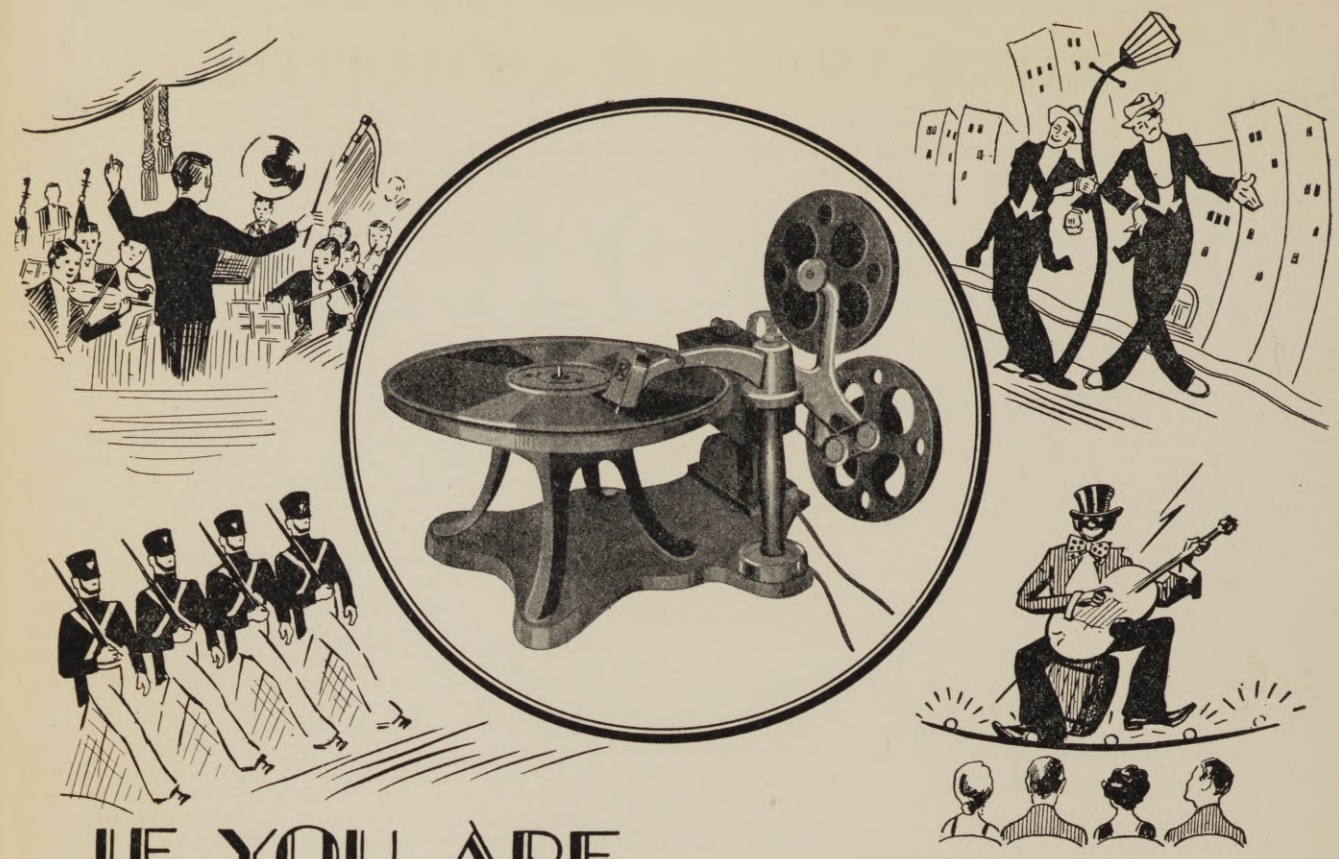
Ultra High Speed Studies Offered for Home Use

BURTON HOLMES Lectures, Inc., have brought out one of the most interesting series of high speed motion studies ever offered the 16 mm. enthusiasts. Three subjects comprise the list of releases, and they are a valuable addition to any 16 mm. library.

"Pigeons in Flight", a study of the flight of the pigeon, is a remarkable picture. It is claimed to be the first photograph showing human eyes how birds fly. It was taken at the enormous speed of 3200 pictures a second by Charles Francis Jenkins of Washington with his $10,000-camera, and the movement reduced two hundred times.

"Diving, High Jumping and Lariat Throwing" compose the second 100-foot reel.

"Hurdling and Baseball Pitching", make up the third. Each are 100 feet in length and may be obtained by writing Burton Holmes Lectures, Inc., 7510 No. Ashland Ave., Chicago.



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THE CAMERA INTELLIGENT

A Few Pertinent Facts Concerning the Demands of the New Type of Amateur and What Bell & Howell Have Done To Fill Them.

By JOSEPH A. DUBRAY, *A. S. C.*

IT WASN'T so very long ago that motion pictures were confined entirely to the professional field. It was a new development —a discovery—something that intrigued the public, something that, as is the fate of all useful discoveries, was praised or denigrated, held as a promise or as a menace, according to the vision or perhaps the interests of individuals, as well as bodies of men, institutions, communities and even nations.

But its place in our modern social system was soon affirmed, and since its appeal was irresistible, its commercialization rapidly evolved in the field which was to present the greatest opportunities of financial success.

The amusement field was the most logical, since it presented the opportunity of retail selling at a very low price with the greatest possible rapidity to the greatest number of people.

The assertion may appear very crude, almost rude, but this does not minimize its truthfulness and portent.

The nature of motion pictures, the very niche that they created for themselves in our general scheme of living, surrounded them with a glamour, a fascination, an atmosphere of romanticism, seldom equalled and never surpassed by any other industrial, commercial, or artistic achievements.

No wonder, then, that the general interest would be awakened to the possibilities of popularizing the making of motion pictures.

The possibility of keeping alive forever the family record, or souvenirs of travel, or other phases of one's life in more vivid manner than through the collection of a number of "still pictures," led the way to the formation of an army of amateur picture fans.

Two great obstacles were, however, blockinng the way—the cost of the necessary apparatus and materials and the intricacies inherent to their operation. Motion pictures making was considered as something somewhat beyond the reach of the ordinary man, something that may be of interest to one, but that could not be approached by ordinary means.

The relative exposure indicator, which, although it has no control over the camera mechanism, is attached to the Filmo 70-D camera for convenience in use.

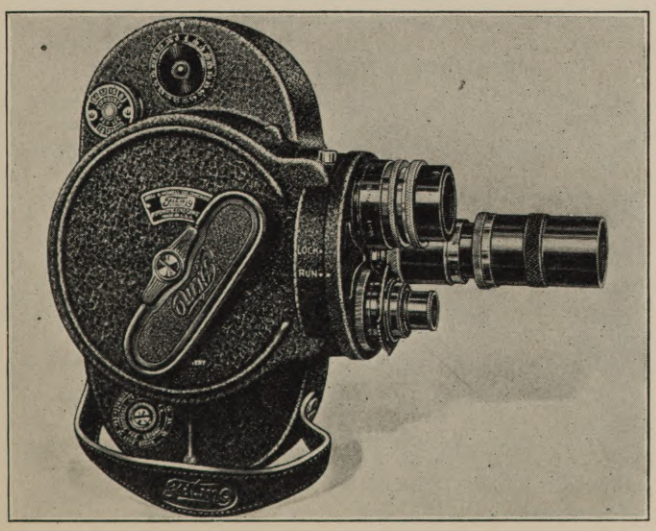
These obstacles were, nevertheless, brushed aside. Films were made and offered to the public at a reasonable cost, the technical difficulties of processing them were swept away by a master stroke, and men of vision designed and manufactured cameras and projectors which could be easily obtained and used.

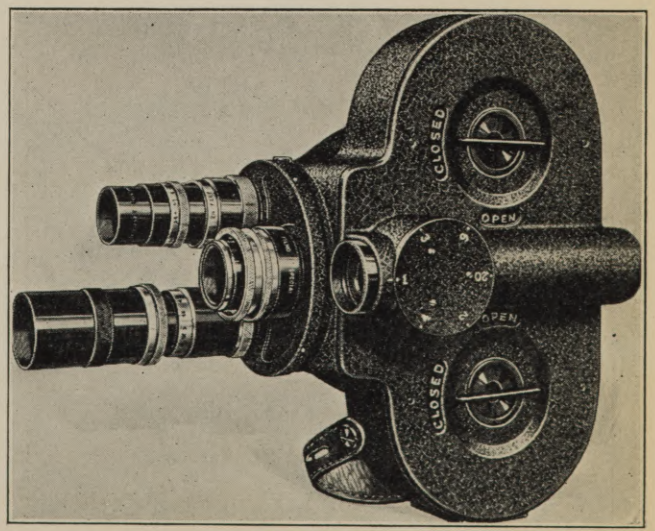
The response of the public was remarkable. Not only did motion pictures invade the home, but they also spurred the man of science and of industry to avail himself of the unlimited possibilities offered.

A new class of motion picture amateur was created almost over night. But can we really call amateurs the number of researchers who today have recourse to motion picture photography as an aid to their investigations? The doctor who records in motion pictures the action of living organisms or the performance of operations? The industrial who applies motion pictures to the precise recording of the functioning of the machines or products he manufactures, the educator who, more and more, realizes the great possibilities of motion pictures as a mighty collaborator?

This new class, which we may possibly call the semi-professional, welcomed the advent of the 16 mm. camera and projector with open arms and requested more and more insistently the creation of new apparatus more able to answer requirements, among which portability of the instrument, dependability, perfection of functioning, ease of operation are paramount.

It also become apparent from all quarters that it was not sufficient nor satisfactory to the amateur to make simple pictures and to rely solely on the interest they awaken just because they "move" on the screen. The amateur began to feel the urge of





At left: Filmo 70-D Camera equipped with 1" F 3.5 Universal Focus, 1" F 1.8 Focusing Mount, and 4" F 4.5 Focusing Mount Taylor Hobson Cooke Lenses. This view shows right side of camera, footage dial and speed adjustment dial above, and the relative exposure indicator below. The folding winding key, starting button and "lock" and "run" index marks also show. At right is a closeup of Filmo 70-D adjustable viewfinder, shown set to match the 1" lens.

adding beauty to the picture, to express his artistic sentiments in them, to rival the cinematographic results that he daily sees on the thousands of theatre screens all over the country—and the semi-professional began to want to take advantage of the truly marvelous technique developed by professionals throughout the world.

The Bell & Howell Company not only felt the pulse of public opinion, but anticipated its desires, and constantly and gradually increased the versatility of the equipment of its manufacture.

And now a new, great, almost revolutionary improvement!—The FILMO CAMERA MODEL D-70.

The features incorporated in this instrument, only two of which will be mentioned in this article, are the logical result of a patient and constant survey of the desiderata of the amateur cinematographer and will satisfy his most exacting needs under all conditions.

First, an improved, quick, and effortless change of lenses through an easily operated, newly designed turret head, which makes possible the choice between three lenses of different focal length combined with an extremely convenient and rapid setting of the finder to match the field of view of the lens. This feature will be especially welcomed by the sportsman, the traveler, the naturalist, and by all in all occasions in which a displacement of the camera is desired where time or space are in default.

The change from one lens to another is so controlled that the camera cannot be operated unless the lens is in its correct position. A truly worth-while detail, which will be appreciated when the switching of lenses is done under pressure of time and excitement.

Second, the variety of working speeds to which the camera can be instantaneously set. From a speed of eight pictures per second to the one of 64 pictures, *through the whole range of intermediate speeds,* which can be done so rapidly, so positively, that it is just "play" to change at a second's notice the natural movement of your subject to a faster tempo or to the slow motion which is so fascinating and enjoyable in the pictures that one takes for pleasure, and which is such an important factor in motion pictures of a scientific or documentary nature.

It would seem, at first thought, that a motion picture camera possessing such versatility should be an instrument difficult to manipulate and requiring expensive and bothersome up-keep. The truth is that the engineers of the Bell & Howell Company have succeeded in devising an instrument which does not require more care of handling than the FILMO of previous design, with perhaps the exception of necessitating more frequent lubrication, and even this operation is made extremely easy by the accessibility of the oil holes.

A great deal could be written about this truly marvelous instrument, but space is limited and we shall reserve the pleasure to return to the subject at another time. We said "pleasure" because it is a real pleasure to refer to a camera which we may call "intelligent" because of the impossibility in which we find ourselves to find a more adequate expression.

Summer Diaphragm Schedule

QUESTIONS regarding summer light and proper exposure have been pouring in, and the following diaphragm schedule is printed with the hope that it will solve the problems of many amateurs. The schedule is for August and September, for black and white pictures.

For sea, sky and beach scenes, or for mountains and distant landscapes, *f*.16 when the sun is shining brightly; if light clouds partially obscure the sun, *f*.11; if the day is dull and cloudy, *f*.8.

For open landscapes or action in areas where there is no heavy shade, *f*.11 in bright sunlight, *f*.8 if clouds partially obscure the sun, and *f*.5.6 or *f*.6.5 if the day is cloudy.

Where houses or trees obstruct part of the light from the sun, *f*.8 in bright sunlight, *f*.5.6 or *f*.6.5 if light clouds are present, and *f*.4 if the day is cloudy.

Scenes in deep shadow or along the shady sides of streets will best be made at *f*.5.6 in bright sunlight, *f*.4 when light clouds are present and *f*.3.5 if the day is cloudy and dull.

Scenes on heavily shaded streets or on porches can be made with the opening *f*.4 when the sun is shining brightly and *f*.3.5 when light clouds partially obscure the light from the sun. If the day is cloudy and dull, such scenes should not be attempted except with the *f*.1.9 lens, used at its widest aperture.

TALKIES BY YOUR FIRESIDE

Bed-time Stories Now Pictures, and Grand-Dad and Grand-Ma Can Hear Their Talkies in Their Easy Chairs.

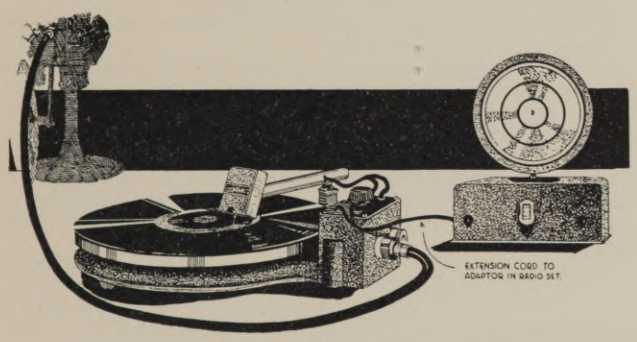
By M. L. SIMMONS

THIRTY years ago it was the penny circus in the barn; today it is the sound film in the parlor. The standards by which the showmanship ability of the younger generation was judged have not budged in these thirty years, but the means by which it is perpetuated has changed beyond recognition.

No more is it the bearded lady posed by Cousin Eleanor, or the fire-eater successfully essayed by Brother Bob, even if it was at the cost of a new suit of clothes. The line that attracts friends and neighbors now goes something like: "Come into my house of talkies."

More specifically, The Home-Talkie Machine Corporation, of 220 West 42nd Street, New York, has given the modern parlor exhibitor a new medium of showmanship in a device that will attach to any home film projector, and which, when plugged in on the radio set, amplifies wax disc records in perfect synchronism with the picture. Thus does the combination genii of radio and screen invade the home, bringing the thrill of the motion picture theatre to the hearthside.

In appearance the home-talkie unit, as it is called, resembles a miniature phonograph, being simple in construction, compact and portable. Perfect synchronism of



Above illustration shows the simplicity of Home Talkie device.

sound and picture is assured at all times by the fact that but one motor drives both projector and talkie unit. A flexible shaft connects the turntable to the projector, and an adjustable driving mechanism governs speed of rotation, so that regular phonograph records may be run on it, thus eliminating the need of a phonograph. An electric pick-up is connected with the radio set through a volume control and extension cable. The regular radio loud speaker is used and is placed near the screen for best results in maintaining the illusion of the talking screen.

The device is not necessarily sold with a projector. For those who already own home projectors—and statistics give it that over 250,000 American homes have had them in operation the past year—the problem of acquiring a home-talkie unit, so far as expense is concerned, is no greater than that which confronts the radio fan planning to buy a new set of tubes.

An interesting feature of the device, in fact one that might be said to be the most important factor in making the showing of talkies in the home practical, is the "ripple killer." Ordinarily, the vibrations of the motor and fluctuations in the motor speed would communicate itself to the talkie unit, causing distortion and otherwise affecting the quality of the sound. The "ripple killer" is in this case a mechanical sedative and shock absorber combined, ironing out the effects of the motor oscillations.

Coincident with the launching of the home-talkie unit for practical home use, the Home-Talkie Machine Corporation has released sixteen film subjects produced by its own studio. Charles R. Rogers, well-known in film circles as co-producer of such outstanding screen attractions as "The Cohens and Kelleys," "McFadden's Flats," "The Gorilla," "Shepherd of the Hills," is head of the producing organization.

Featured in these sixteen subjects are Eddie Dowling, popular stage and screen star; Phil Baker, musical comedy comedian; Erno Rapee, composer, and conductor of the Roxy Symphony Orchestra; Miss Patricola, Radio-Keith-Orpheum star; Abel Baer, popular song composer; Fred Ketch, ventriloquist; Guignol Studio Marionettes, Peggy Hanlon, Evangeline Murray, and an eight-piece orchestra, to be known permanently as Home-Talkie Syncopaters. The marionette and ventriloquial subjects represent a new departure in the talkie field, entertainment of this character having never been attempted by theatrical producers.

The company's avowed policy is to comb the vaudeville, legitimate, radio, concert, operatic and motion picture fields for the best talent available, to produce such subjects as are best adapted for home-showings, with its own producing personnel and its own directors. This is in itself an innovation; for, in the past, such films as have been available for home showings were condensed extraced versions of old films that had outlived their usefulness in the theatre.

And so, summed up, the Home-Talkie Machine Corporation's activities are pioneer efforts in at least two instances: one, the launching of an inexpensive device that brings it within the reach of practically every person who owns a radio set; two, the producing of screen subjects, made essentially for home consumption. And, to harp back to the opening of this article, capping the evolution of home ownership, it takes little imagination to picture a sleepy child saying to a very relieved father: "Daddy, can I hear a bedtime picture?"

Below is a close view of the Home Talkie unit which may be attached to any 16mm. projector and played through the radio.

AT THE BOTTOM OF THE SEA

Dan Clark, A. S. C., Takes a Look at Some Horses Hoofs From a Peculiar Spot—And Gets His Picture, Too

By LORETTA K. DEAN

This is the second of a series of stories of the adventures of A.S.C. members. Watch next month for another story of Cinematographic adventure.—Editor's Note.

A CAMERAMAN down beneath the waters of the Pacific ocean in a home-made diving bell . . . . a wooden contraption with a glass top . . . . just ordinary window glass cemented into place. Two horses suddenly gone made with excitement, threshing about in the water and with iron-shod hoofs kicking the thin glass covering of the bell a few inches from the cameraman's head. . . .

No, this is not a scene from a motion picture—it is just an experience in the life of Dan Clark, Fox cameraman, and former President of the American Society of Cinematographers.

Those individuals who think that there is nothing of adventure or interest in the lives of our cinematographers may well rub their eyes, for the cameramen rarely mention such occurrences; just take them as part of the job and forget them as they pass.

It was some years ago that Clark did his diving act. He was head cinematographer for the Tom Mix unit at Fox studios, and there was a sequence in which two horses and their riders were to be photographed out in the ocean. Someone thought it would be a good shot if a camera could be put under water and a closeup procured of the swimming horses from directly beneath them.

Clark, always fearless, agreed, and it was planned to make this shot. However, a diving bell could not be secured in time to do the work and production couldn't be held up—you know how picture companies are on those things.

So, Clark designed his own diving bell and built it.

"I had to do a fast job on the bell," said Clark, "and when I had it finished I didn't know whether it would hold the water out or not. I had nothing but ordinary window glass for the top, but figured it would work if the cement held.

"We took the bell over to Catalina Island with us and took it out on a lighter with the horses and made ready for the shot. I had no time to fix up much breathing apparatus, but figured that a tube running up to the surface would give me plenty of air. I had another rope going to the surface also. I was to jerk it three times as a signal to be pulled up. An assistant was to keep the rope in his hand all the time in case anything happened.

"Well, all was ready, and I climbed into the bell and the lid was shut down and I was lowered beneath the water. I had a funny feeling, I admit, as I started down. I couldn't help wondering about the cement holding that glass top. It was supposed to be waterproof, but you know how those things are.

"I was all set and gave the signal. Over went the horses. But we thought they would be rational horses. They were not. They were the flightiest horses I ever saw. They became frightened and started kicking around in the water as though they were in a swarm of bees. I started cranking and was getting some great stuff . . . But just then for some reason my diving bell came a little closer to the surface, and in a moment those horses hoofs were beating a tattoo on the top of that old diving bell.

"I pulled my rope for help, but no one answered and the kicking continued. I learned later that the fellow who was to pull me up, had got excited and had gone ashore. As nothing broke I shot a few more feet of the horses—and then they passed along and I was brought to the surface."

"How about the scene, was it successful?" we asked. "Oh, yes, great," replied Clark. "But I never used that bell again. I kept it in my back yard for a long time. It had the marks of the horses hoofs on it. Used to give me a kick every time I looked at it."

This man Clark photographed Tom Mix's pictures for seven years, and for a time was the great wild and woolly cinematographer at the Fox lot. But he says he was really the railroading cameraman, for he saw more of engine tops, brake rods and the sides of railroad cars than he did of the wide open spaces.

"That man Mix was always getting a railroad train into his pictures," said Clark, "and invariably we had to have our camera on some unheard of spot about the train. One day we would be fastened on the cow-catcher of the engine, dashing along with camera pointed up to the front of the engine where a battle would be in progress. The next day we would be on a hand-car in front of the engine, racing over the rails at terrific speed. Oh, there was not much horseback riding for us in those westerns.

"Once we had our camera out on the side of a passenger car on a platform that was hooked onto the side. As the train dashed through the mountain country the limbs of the trees along the track almost tore us off, but somehow or other we hung on and got our picture. It was a lot of fun, though."

Can you imagine fun in that? But, then, these cinematographers don't seem to mind danger a bit.

Another time Clark was on location in Merced Canyon with a Mix unit. A terrific rapids was the location and a girl was supposed to swim the rapids. Something went wrong and in no time the girl and four men were in the water struggling for their lives. Clark was with them. They lost the girl, and three of the assistants narrowly escaped drowning. Clark didn't tell us this, but it was his unusual knowledge of First-Aid methods that saved a couple of the other swimmers from death after they had been fished from the water.

For seven years Clark shot Mix pictures, a total of sixty-two of them. And he says he enjoyed every thrill in that time.

Dan Clark, A. S. C.

Clark is an unusual type. He has done a little of almost everything in his time. Born in Hermitage, Missouri, he drifted into the mining game as a metallurgist. He started the pioneer silver flotation mill of the country. He found his way into the business of being a butcher at one time. Then he became a baker—he says, boastfully, for a change, that he made good bread, too. Then he became a telephone switchboard man. Then he found his way into the army.

Finally, quite by accident, he broke into pictures as a handy man in the laboratory at Fox. From that he became an assistant cameraman and then a second, and then a first cinematographer, and then took over the duties of the Mix unit.

But he no longer films the westerns. He couldn't get away from all the excitement, however, so did the "Air Circus" which took him into the air. "Red Wine" is another of his pictures, a South Seas epic is another and "Why Leave Home" another.

Clark is an attractive type of man. He resembles a hard-boiled army first Seargent, but he has a heart of gold. Gruff in manner he is, but beneath it there is a friendliness and a charm that wins you immediately. And, like the other cinematographers, he is modest.

A Slip and It Is Tragedy Here

Above are shown a few of the dangerous and thrilling episodes in the camera work of Dan Clark, A. S. C. These odd camera locations were all used in making Mix pictures. Lower left is a home-made diving bell being lowered into the ocean with Clark inside it.

Emotional Appeal of Color

(*Continued from Page 6*)

and Afterglow which make with this color a series increasing progressively in warmth. It is mildly stimulating, suggesting a mood of lively interest and attention, but not one of high excitemen or nervous tension.

Tint No. 5, Candleflame. A pastel orange-yellow. It is slightly lower in transmission (75 per cent) than Sunshine giving a screen more orange in hue and lower in brilliance which definitely suggests artificial illumination when used on interior scenes. Somewhat warmer than No. 6. Possibly useful on exteriors in suggesting morning or afternoon with less intense sunlight than prevails at midday. By objective association useful in inducing rather mild mood reactions such as feelings of coziness, comfort, intimacy, well being, peace and plenty without opulence, etc.

Tint No. 4, Firelight. A soft yellow-orange. This is warmer than Candleflame to which it is closely akin in mood reaction value. The lower transmission (66 per cent) gives a somewhat less brilliant screen and this with the more orange hue makes it particularly adapted for use on an interior scene where it is desired to suggest an artificial illumination softened and subdued perhaps by shaded lamps and candles. It is suggestive also of illumination emanating from an open fire; but is not quite orange or red enough to satisfactorily render the fire itself if visible, for which Afterglow is perhaps better. It stimulates mood reactions of the same category as Candleflame but with greater intensity. Suggestive of warmth, comfort, intimate home relationships, mild affection, etc.

Tint No. 3, Afterglow. A soft rich orange color. It is probably the warmest color of the series. It is appropriate to exterior scenes at dawn and sunset. It lends to interiors an atmosphere of warmth and intimacy stronger than firelight. It should excite good reactions in general connected with luxury, wealth, security, and relatively strong affections. It is also related to the autumnal mood by obvious direct association with the autumn colors of nature. By indirect or subjective association it is symbolic of the same relative period in the life of an individual and its associated moods. It is indicative, therefore, of repose, ambitions attained, accomplishment, and similar psychological aspects of maturity.

Tint No. 2, Peachblow. A delicate flesh pink. This has a small, but definite blue content, making it somewhat less warm than Afterglow. It is adapted to the rendition of close-ups where it is desired to do full justice to feminine beauty. The hue and saturation are such as to suggest the glow of life.

Tint No. 1, Rose Doree. A deep warm pink suggesting sensuousness and passion. Amorous, Romantic, and Exotic. It is adapted to the rendition of scenes representing an intimate atmosphere such as a luxuriously appointed boudoir. In keeping also with feeling of happiness, joy, and excitement.

Tint No. 7, Verdante. A pure green, rather pastel in character. It is the hue of spring foliage suggesting directly trees, grass, and vernal landscapes. By subjective association typical of youth, freshness, unsophistication, innocence, etc. It is only slightly warm, but definitely not cold. It is very close to the neutral point in the warm-cool scale.

Tint No. 8, Aquagreen. A brilliant blue-green. The color of more northern waters and suitable to the rendition of the sea under clouds and in storm. It is suggestive of wetness. Its transmission (40 per cent) being lower than that of Verdante, it gives a less brilliant screen. This together with its greater blue tint probably makes it more suitable for the rendition of the darker green of mature summer, foliage, dense forests of pine, jungles, etc. By extension from the objective correlation to summer it is suggestive of such mood reactions as pertain to maturity, wisdom, dignity, repose, and restfulness. It is cool but not cold; tranquil, but not subduing.

Tint No. 9, Turquoise. A clear brilliant blue. It is definitely cool, but less cold than Azure or Nocturne. The visual transmission (43 per cent) is high for a blue of this hue but low as compared to the warm colors. This gives a screen of depressed brightness which together with the hue tends to produce a mood of peace, reposefulness, and tranquility. It is the color of calm tropical seas under clear skies. It is suggestive of the Mediterranean and the South Sea Islands. If used on interiors it should impart a feeling of restfulness, dignity, and reserve without inducing appreciable depressive moods. With proper contextual influence it might be used for the suggestion of brilliant moonlight effects although No. 10 may be somewhat better for this purpose.

Tint No. 10, Azure. A strong sky-blue. It is colder than Turquoise; tranquilizing to the point of becoming depressing. The visual transmission (28 per cent) is relatively low and hence gives a screen of low brightness. It is suggestive of the sedate and the reserved, even approaching the austere or forbidding; under certain conditions slightly gloomy.

Tint No. 11, Nocturne. Deep violet-blue. The visual transmission is low (28 per cent) giving a screen of low brightness. It definitely suggests night, shadows, gloom, coldness, etc. By subjective associational reactions appropriate to depressive conditions, despair, failure, unattained ambitions, intrigue, the underworld.

Tint No. 12, Purplehaze. A bluish-violet or lavender, rather pastel in character. It has a relatively high visual transmission (40 per cent) giving a screen of greater brilliance, higher key, than the adjacent tints, Nocturne and Fleur-de-lis, to both of which it is closely related in emotional value. The mood induced by this color is particularly dependent (more so than many of the other colors) upon contextual factors. For instance, to a twilight scene on the desert with distant mountains it imparts a feeling of distance, mystery, repose, and languorous warmth; while used on a scene containing snow fields, glaciers, snow-capped mountains, etc., it has a pronounced cooling effect. The hue of this color is approximately the same as that of the shadows on sunlit snow under a clear blue sky.

Tint No. 13, Fleur-de-lis. A rich royal purple. This color has long been the badge of royalty, high office, power, and pomp. In ancient times the dye was very costly and was used to color the garments of the aristocracy. The transmission of this film tint is low (25 per cent) thus giving a depressed screen brightness suggestive of reserve, dignity, and austerity. It has a relatively cool color but not as cold as Nocturne.

Tint No. 14, Amaranth. This is also a purple but has a greater red content than Fleur-de-lis, therefore it is warmer. Appropriate to king and court in a benevolent, smiling, happy mood, less austere and dignified than is suggested by Fleur-de-lis. It is adapted to the rendition of scenes showing opulence and luxury together with refinement. With proper contextual relation it may be well adapted to scenes approaching sensuality and abandon, such as bacchanalian revels when staged in settings of wealth, luxury, and elegance.

Tint No. 15, Caprice. Cool pink. Visual transmission (53 per cent) relatively high, thus giving a brilliant sparkling screen. Mardi gras, fete days, and merry making in general. It is mildly exciting and exhilarating in an innocent fun-loving sense.

(*Continued on Page 38*)

Klieglights

(Continued from Page 21)

range of from 5′ 9″ to 8′ 5″, or demounted for carrying aloft. A device on the yoke and hand clamps provides means for holding the projector securely in any set position. A dimmer on the base permits full or gradual control of the light from black-out to full-brilliancy.

KLIEG SIDE-FLOODLIGHT (No. 1153) is a high-intensity variable-range floodlight giving an evenly-diffused brilliant light for general illumination; projecting the beam usually in a horizontal direction or at a slight angle above or below the horizontal; used as a side lamp for general lighting of deep studio sets and close-up photography; accommodates a 1000,- or 1500-watt P S 52 Mazda lamp.

Projector consists of a deep, glass-lined reflector fitted with a mogul-screw-base receptacle, assembled in a sheet-metal housing, supported by a yoke; mounted on a telescopic pedestal, and set on a base equipped with ball-bearing, rubber-tired casters so that it may be easily rolled about.

Reflector is of parabolic contour made of spirally-rifled heat-resisting glass, giving directional control and diffusion of the light beam. A mogul-screw-base receptacle is set back of the reflector to accommodate the lamp, and a sheet-metal housing affords protection for the glass reflector and the lamp.

Reflecting unit is mounted in pivot bearings, so devised that the lamp is perfectly balanced, and can be turned in any direction. Hand clamp on the yoke affords means for clamping the lamp in any angular position.

The reflector may be raised or lowered within a range from 4′ 8″ to 6′ 8″, or can be demounted for carrying aloft. Standard and yoke are of tubular construction, fitted to a light cast-iron base with the upright held securely by guy rods. The snap switch is encased in the receptacle housing.

KLIEG TWIN-FLOODLIGHT (No. 1150) is a wide-spread high-intensity floodlight for general illumination, projecting an evenly-diffused light over a large area; used for lighting foregrounds, close-ups, and general lighting of studio sets; accommodates two 1000-watt or two 1500-watt P S 52 Mazda lamps.

Projector consists of an all metal box reflector fitted with two screw-base receptacles; mounted on a telescopic pedestal, set on a base equipped with ball-bearing, rubber-tired casters, and so designed as to allow variations in the projection of the light in every direction, adjustments in height, and to roll easily over the floor.

Reflector is a spun aluminum set in a deep, open-front, sheet-metal box. The contour of the reflector is parabolic, giving directional control of the light, and its surface has been chemically treated to produce controlled diffusion of the light. The receptacles are placed well toward the rear, with the lamps close to the reflector.

Provisions have been made for ample ventilation—and slide grooves on the front permit the use of a diffusing screen. Special bracket mounting allows angular variations in a vertical plane, and telescopic pedestal permits head to be raised or lowered from 5′ 3″ to 7′ 5″, turned in any direction, or demounted, and set on a short pivot on the base with beam center 26″ from the floor.

KLIEG SPOTLIGHT (No. 8 N 22) is a high-intensity, long-range spotlight for use with incandescent lamps; projects a concentrated beam of light any distance up to 100 ft., gives a 3-ft. spot, or a wide spread; and is used in the studio for: back lighting—to give depth to the picture; cross lighting—to eliminate facial shadows; spot-lighting, follow-up floodlighting, modelling, and for special lighting effects; accommodates a 2000-watt concentrated filament G 48 Mazda lamp.

Spotlight is flexibly mounted on a telescopic pedestal stand; can be set at any angle, raised, lowered, or turned in any direction; and the base is fitted with casters permitting it to be rolled easily over the floor.

Lamp housing, 22-inches in length, is light-tight, thoroughly ventilated, and equipped with: an 8-inch condensing lens—so supported as to allow unrestricted expansion of the glass to avoid breakage; a mogul-screw-base receptacle—mounted on a sliding base, with a vertical adjustment for centering the light source, and a rod extending through the rear of the housing for focusing; a concave chromium-plated reflector—mounted back of the lamp to insure full utilization of the light source and to intensify the light beam; a large, self-closing spring door—on one side of the hood which permits easy access to interior for changing lamps; and slide grooves—on the front of the hood for holding iris shutter, or other devices used in obtaining special lighting effects.

* * * *

A folder describing these units in detail, can be obtained by writing to the manufacturer—Kliegl Bros., 321 West 50th St., New York City.

Cinophot Handy

WITH the arrival of summer's intense light movie makers find it difficult to decide what light conditions calls for f.16 or f.8 on their Ciné-Kodak. These amateurs will find the Cinophot a useful and handy article to have with them. It is a tried exposure meter, and a valuable accessory.

The Cinophot resembles a small telescope. In use, it is placed to the eye and pointed at the scene to be photographed. If the light is at all suitable, the Ciné-Kodak speed figure 1/32 will show in the meter. A quick turn of the iris collar on the Cinophot extinguishes this figure. The iris is then turned slowly back until the figure shows very faintly. The index number on the outside of the Cinophot then shows the correct diaphragm stop for the prevailing light condition.

The Cinophot is packed in a sturdy sole leather case, and is so small and compact that it can be carried in a coat pocket. Complete, with case and instructions, it is on sale at all dealers and the price is attractive. The Dremophot is also as valuable if you have a Filmo.

Emotional Appeal of Color

(Continued from Page 36)

Tint No. 16, Inferno. Fiery red tinged with magenta. Since it is directly suggestive of fire, it is adapted to scenes of burning buildings, glowing furnaces, forest fires, etc. By subjective association indicative of riot, panic, anarchy, mobs, turmoil, strife, war, battle, and unrestrained passion.

It is not desired that the reader shall gain the impression from this rather enthusiastic discussion of the potential emotional value of color that the lavish and unrestrained use of color treatments is advocated. On the contrary, it is desired to emphasize the necessity of using the color accompaniment to a motion picture production with care and discretion. The use of too strong or saturated colors is in general not good since such colors are usually obtrusive and distracting and may defeat, rather than promote, the attainment of the desired effect. A more subtle method will yield better results. This involves the employment of pastel tints which may be increased in subjective strength for a brief period of time by the action of successional contrast or juxaposition in time. Thus the eye accommodated to, or fatigued by a green, such as Verdante, will perceive, at the beginning of the following scene done on a pink tint, a color of enhanced subjective saturation. This immediately fixes the mood of the scene after which the accommodational processes in the retina begin to operate and cause the effective saturation to decrease appreciably. Thus the color having fulfilled its mission, saying definitely that this scene has a specific emotional atmosphere, fades into the background, and while continuing to make itself felt in the subconscious mind of the observer by lending a warmth and softness to the scene permits the action to carry forward the dramatic sequence without the unpleasant and distracting influence of pronounced color.

There are perhaps some who may question the advisability of attempting to use color on the screen as an aid to the creation of an emotional atmosphere on the ground that individuals react differently to the same color. Is it not true that the same musical composition may excite widely different feelings in individuals, and that the same word or phrase may convey to different minds widely divergent ideas? Perhaps it will be necessary to spend much time and effort on the development of a language of color, to compile dictionaries with definitions of the symbolical, associative, and emotional values, just as we write and agree upon definitions of words in order that specific ideas may be conveyed from one mind to another by spoken and written language. If there is in the human mind, or, more specifically,, in the collective mind of the motion picture public, a color consciousness even though it be at present latent or but slightly developed, is it not worth considerable effort in thought and experimentation to develop a technic such that color can be applied to the screen in such a way as to enhance the emotional and dramatic values of the motion picture of the future?

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6. *Loc Cit.*, p. 11.
7. Opie's Lecture *IV*, p. 147.
8. Luckiesh. The Language of Color. Dodd, Mead and Company, 1920.
9. *Loc Cit.*, p. 200.
10. N. A. Wells. Psych. Bul. 7:181. 1910.

American Cinematographer Opens Chicago Office

The AMERICAN CINEMATOGRAPHER has opened an office in Chicago. This office is in the capable hands of Daniel J. Goff, who has been in the cinematographic and publication business in that city for the past seventeen years. Mr. Goff took over the representation of the magazine on August 1.

Mr. Goff is located at 3668 South Michigan Avenue, and at all times will be available to assist advertisers and readers of this magazine in any and all ways. It is the aim of this magazine to give the greatest possible help to amateurs, and the Chicago amateurs will find Mr. Goff ready and eager to do anything he can to aid them. His office telephone is "Boulevard 5444."

Sound Men and Cinematographers Discuss Problems

(Continued from Page 8)

single camera has several frequencies and various harmonics rather than a noise like a motor hum. By the time all these frequencies were filtered out you would have nothing left to properly record music or even the voice.

Question 5.—(a) Masking microphones, except in rare cases, is a bad business, and every attempt should be made to make this practice unnecessary.

(b) It is not so much the design of the microphone as it is the design of the set. It seems to be a question of relative distances between the speaker and the microphone and the microphone and the walls. The answer does not lie in the question of microphone development. It is a question of set acoustics and reverberations. As a general rule, the further away the microphone is placed from the speaker, the poorer the speech.

Question 6.—(a) and (b) These questions are answered together. Since the picture to have the proper contrasts and balance should have a higher gamma than the sound track, it is necessary for the cinematographer to add a certain degree of contrast to his lighting so that the picture will look right even though development is designed to secure an overall gamma of unity, which is considered the proper development for the sound track.

However, since in most studios the picture negative and sound track negative are developed separately, this matter is no longer a problem.

The consensus of opinion was that the negative sound track should generally not be developed to more than a gamma of .6—this would enable the laboratories to develop their positives in the usual manner without being forced to overdevelop the picture negative to a point where graininess and other defects might appear in order to get the proper pictorial contrast in the positives when the picture and sound track are printed together.

Question 7.—(a) It would give much greater freedom to the cinematographer, eliminate booths and other cumbersome sound apparatus. The consensus of opinion was that it would be a great step forward in the making of the talking pictures.

(b) Many of the technical difficulties in the development of a satisfactory directional microphone were discussed at length, and it was brought out that great advantage could be gained by the development of such a microphone. It was also brought out that manufacturers are striving to produce a satisfactory device.

Miscellaneous Questions

There was much difference of opinion as to the relative merits of sound on wax and film. But the consensus of opinion was that if equal quality could be obtained by recording on film, the greater simplicity of film recording apparatus, together with certain advantages that this type of recording has for the cameraman and cutter, the sound on film system would eventually be employed by all studios.

For sound reproduction in the theatres, proponents of both the film and disc methods gave logical arguments in favor of their relative systems. After much discussion the majority of critical opinion seemed to favor the disc method as being more practical for a majority of theatres—at least for the present. Discs can be replaced at small cost, and while the film can be used longer, the relative cost of replacement is very high. The discs with certain deficiencies in the low frequencies sound better because of this deficiency in theatres with poor acoustic properties. Altogether, it was felt that film recording would eventually be employed in all studios for making the records, but, for the present, the discs seem more practical for the theatres.

A complete account of the discussion between the sound engineers and cinematographers will be printed in the CINEMATOGRAPHIC ANNUAL, *which is now in process of compiliation. The entire proceedings of all such meetinfs will also appear in the same* ANNUAL, *orders for which are now being taken at the office of the* AMERICAN CINEMATOGRAPHER. *This* ANNUAL *will be published by the A. S. C.*—EDITOR'S NOTE.

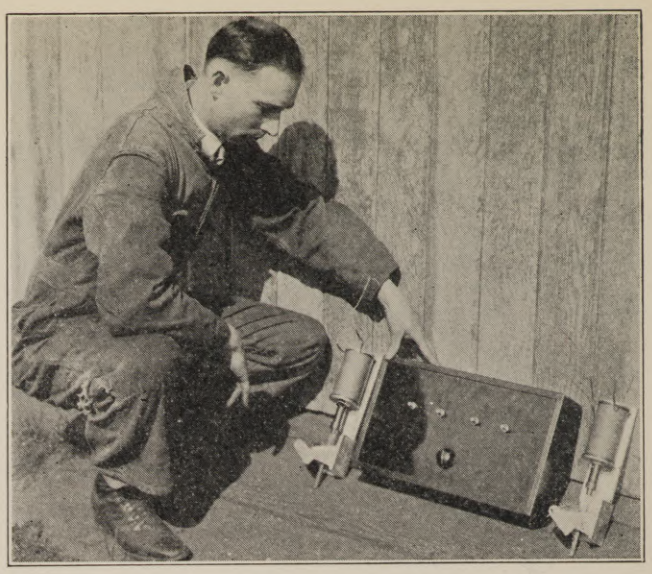
Mitchell Camera Corporation Moves to New Home

ANOTHER outstanding milestone in the history of the Mitchell Camera Corporation was passed on July 5 when this Hollywood organization moved into its new home at 665 North Robertson Boulevard, West Hollywood.

Starting eight years ago in the manufacture of the Mitchell Camera, this organization has grown and prospered in a remarkable manner, and today is housed in a plant that is second to no industrial establishment in the country from the point of view of efficiency, beauty and comfort to the workmen, and is a fit monument to the ability and progressiveness of President Hy F. Boeger and Secretary George H. Mitchell, who have guided the concern since its inception.

Ground for the new plant was broken on January 21, 1929, and the erection of the building has been a rapid bit of construction work. The plant, which houses offices and factory, contains 26,000 feet of factory floor, and is of concrete, steel and glass. The floors are of sawed wood blocks set in concrete slabs for the comfort of the workmen. Every known modern convenience is found in the plant, which is the last word in industrial construction.

In next month's issue of the CINEMATOGRAPHER will appear pictures and a detailed story of the new plant. At the present the AMERICAN CINEMATOGRAPHER and the A. S. C. congratulate Mr. Boeger and Mr. Mitchell and their associates on their great progress and on their magnificent plant.



Automatic Projector-Operator and H. J. Fenner, inventor.

New Automatic Projector-Operator Announced by Portland Firm

THE aim of all exhibitors, big or little, is to achieve perfection in projection at each and every performance at their motion picture theatres. While it is true that the combination of "weak" pictures and perfect projection will not make a high-grade show, it is at least a known fact that perfection in projection does make a poor picture more satisfactory to the audience.

Ill-timed change-overs break the continuity of a feature, thereby causing the audience's interest to lag. Long delays from film breaks, not to mention the possibilities of fire from such an occurrence, tend to make more grief for the exhibitor.

"Trifles Make Perfection. Perfection Is No Trifle," said the great Angelo. And with this thought in mind, Howard J. Fenner has invented a new Automatic Projector-Operator which its backers declare will revolutionize the projection of motion pictures.

"The purpose of this machine, which is fully covered by patents," says the announcement, "includes four essential features: It automatically accomplishes the change-over from the the picture being shown. Moreover, the audience is not conscious of the change, which always takes place at the same point projector in operation to the one carrying the successive reel of in the program. Second: It automatically stops the projector in case of a film break. Third: It automatically cuts out the burning light rays of the projection arc by means of a shutter that closes the light hood. Fourth: The machine will start the turntable motor of the talkie apparatus any length of time ahead of the change-over, thereby allowing the record to attain full speed at the time the change-over is made.

"The outstanding features of the apparatus are that it automatically effects the change-over and continuity of the picture from one projection machine to the other. This feature is doubly valuable," continues the announcement, "as it *does entirely away with an extra human operator*. The change is perfection—far more so than any change that could be made by the most expert hands. Once correctly timed the synchronization is the same at every performance.

"In the case of the film break the automatic stop feature prevents over rotation of the winding reel, which heretofore has caused much damage to the film and excessive delay in repairing the break.

"The fire hazard that exists when these breaks occur is worthy of intelligent consideration," says the inventor, "particularly by the small exhibitor. Not only is the danger of serious fire losses from burning film entirely eliminated, but the insurance rate is also affected."

The Automatic Projector-Operator is being manufactured in Portland, Oregon, by the Automatic Projector-Operator, Inc., 322 Corbett Building, from whom additional information may be obtained. Robert B. McElroy is president.

Professional Equipment Devised for Amateur Cinematographer

The most outstanding bit of news in the amateur field in the past month is the announcement by the Movie Specialty Manufacturing Company of 1361 South Flower Street, Los Angeles, of three new devices for the use of the amateur cinematographer.

These devices are a Matte Box, a Micro-Focus-Meter and a Title Hood. The devices are the creation of O. W. Heinz, and bear his name.

To those Amateurs who aspire to do the things with their cameras that the professionals do with theirs we unhesitatingly say that the Heinz devices will be a revelation, and after seeing what can be done with them we do not hesitate to state that the serious-minded Amateur who wishes to do more than merely make snap-shots will be making a wise investment if he procures any of these new articles of equipment for his use.

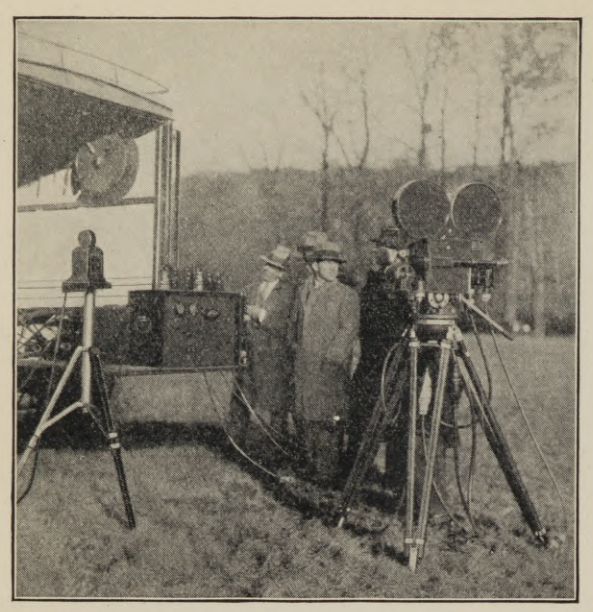
Time and again one hears an Amateur saying he wishes he could do this trick or that with his camera. Now, with this matte box, micro-focus meter and title hood untold accomplishments are possible. Fade-outs, dissolves, double and triple exposures, fog and moonlight effects, vignetting, and titles with animated backgrounds are all at the command of the amateur with these devices.

The micro-focus meter is a device which assures correct focus and exposure and adds the professional touch. The images are erect and not upside down, and it is magnified either 15 or 22 times.

In the matte box the Amateur who wishes to add the professional touch to his work will find an adjustable iris, a complete set of filters, and a group of horizontal dividers which make possible tricks that heretofore the amateur has only hoped for.

The title hood is a simple device, but one which will be a boon to Amateurs who wish to make titles that are something more than mere printed cards. With this title hood, for example, an Amateur can picture the foamy waves breaking on a rocky shore and gradually dissolve his title into this shot with the waves in the background. It is equipped with a title guide, semi-transparent cards for positive titles, transparent cards for double effect trick titles, title fluid, and directions for making more than 50 styles of titles. For artistry in title making serious-minded Amateurs will find this device one of the most valuable pieces of their equipment.

O. W. Heinz, the creator of these devices, is a man who spent years in the manufacturing end of the automobile business. He is a mechanical engineer of unusual calibre, and after a long period of consideration, turned his creative powers into the Amateur cinematographic field, and is applying the same serious thought to devising equipment for the amateur cinematographer that he formerly put into creating improvements in mechanical construction of the motor car. With his fresh point of view, he readily saw what the Amateur needed and his three devices are the result. He is now at work on a new amateur 16 mm. camera.—(THE EDITOR).



This illustration shows the Akeley Gyro Tripod in actual use by the Western Electric Company, taking sound moving pictures.

Again AKELEY

. . . anticipated necessity
with a tripod ideal for Sound Pictures

"GIVE us the best camera tripod that human ingenuity can devise!" This was the demand of the sound cinematographers.

It was characteristic of the Akeley Company that its research laboratories had already anticipated this demand and were putting on the market such a tripod—a tripod quiet in operation, capable of great speed and flexibility, vibrationless but light, staunch yet easy to manage.

The Akeley Universal Gyro Tripod, containing the famous gyro mechanism, stands today a leader in this latest field of photography. This tripod is in constant use in many leading motion picture studios making Sound Pictures. These studios include Metro-Goldwyn-Mayer, Fox-Case Movietone, Pathe and Paramount. Other world wide corporations, such as Radio Corporation of America, Westinghouse Manufacturing Company, Western Electric Company and General Electric Company are enthusiastic users of th › Akeley Gyro Tripod in their important work. We invite you to write for full description of this Tripod and details of our deferred payment plan.

AKELEY CAMERA INC.

175 Varick Street New York City

The Akeley Universal Gyro Tripod

"Success"

(Continued from Page 9)

the remains of his morning meal, made up his cot and brushed the floor. Then, from an old trunk in the corner he extracted a large envelope. With trembling hands he untied the string which bound it, and withdrew a picture and a letter. The picture was that of a woman in her thirties. Apparently she had once been very beautiful; but there were deep lines of care about her mouth and forehead.

For a long time the old man gazed at the picture. Then he slowly opened the letter.

"Charles—I love you, darling, but I can't go on. I can't continue starving while you do nothing but fail—and promise success. For twelve years I have tried it. I am worn out. I can't go on. Forgive me . . . Agnes."

The old man picked up the photograph again. For perhaps a minute he looked at it. Then, as two great tears rolled down his cheeks, he clasped the picture to his breast.

"Agnes, Agnes," he cried. "I told you I would succeed sometime. I told you I would not always fail."

In a few minutes he was calm again. He placed the picture and letter in the envelope and returned them to the trunk. Picking up his make-up box, he left for the studio.

NOW then, Pop," said the director, "Your part describes you as a retired banker. Your youngest son has gotten into jail for about the fiftieth time. You discover this while reading your paper in the library. You must register great wrath. Call in your eldest son and tell him to get your lawyer as you are to cut your boy out of your will without a dime. You raise your hands on high and start to curse him. But right then you fall back in your chair with a paralytic stroke."

The scene was rehearsed a half dozen times.

"All ready," said the director.

The old man was rising to the occasion remarkably, much to the relief of all for he had been given the part solely because there was no other actor in the city to fit the character.

"Cut," shouted the director, as the old man fell back into his chair.

"Marvelous work, Pop," he added. "We should have had you in our last picture instead of that wooden-headed lump of clay we brought on from Hollywood. Why you are going to be a success in your old age."

The old man smiled from his chair.

"Guess we'd better have a closeup of that," added the director.

The cameras were moved up and the electricians were trimming the lights. But the old man sat still in his chair.

"All right, Pop," said the director. "Let's get going for a closeup." The old man did not move.

"Say," exclaimed the director, "What do you think this is, a sleeping porch! Just because you made good is no reason why you should take a nap between scenes."

THIS is getting to be a hell of a business" remarked the director a half hour later. "Give an old simp a chance to make good, and he dies in the middle of his picture."

But the director never dreamed that the old man had reached his goal.

Amateur Movie Making

(Continued from Page 27)

though they are so valuable to the cinematographer, they are not proportionally costly. Anyone who is reasonably handy with tools can easily make his own, and the others can have them made very cheaply. In their simplest form, they are merely large sheets of smooth-surfaced compo-board, sized, and coated with aluminum leaf. This makes the so-called *hard* reflector, which reflects the maximum of light. The *soft*, or diffuse reflector is about the same, but with a matte surface. Either of these will do well with any kind of film, though some studios use gilt or bronze-surfaced ones with panchromatic stock. For convenience and protection the studios usually place a light wooden frame around the edges, and hinge a prop on the back, so that the reflector may be supported at the proper angle, and need not be held by hand.

For amateur use, at least three reflectors should be used: preferably two soft and a hard. Four—two of each kind—is a better assortment, and hardly more expensive. It takes only a little practice to become skilful at lining up reflectors on a subject, and the results amply justify the slight additional trouble incident to their use, for they eliminate or lighten unpleasant shadows, and enable the cinematographer to paint with light as surely outdoors as he does within—and without the cost of current, etc., that often harasses the maker of home interiors. So far as is known, the only price of using the sun for a light-plant is an occasional sunburn!

Mrs. Herbert Hoover Now Member of Amateur Club

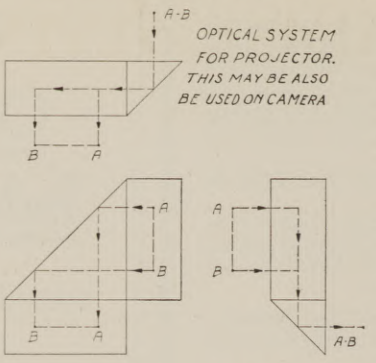
To the Amateur Movie Club of Waterloo, Iowa, goes the unusual honor of having as a member the First Lady of the Land.

Mrs. Herbert Hoover, who was born in Waterloo, was recently elected to life membership in the club. Incidentally, the club claims the distinction of being the first amateur club to be organized in Iowa. Mrs. Hoover is an ardent amateur, and the club rightfully is proud to have her as a member.

Wide Image

(Continued from Page 17)

plane. One of the worst objections to the present size picture is the fact that it has lost, in a large measure, the quality of naturalness. Normal vision subtends an angle that is approximately twice as wide as it is long. This horizontal angle is somewhere in the vicinity of 100 degrees with a vertical angle of about 50 degrees. The standard motion picture, as projected today, appears almost square and this is one of the reasons why present pictures do not appear natural on the screen. The horizontal dimension is not correctly proportioned to the vertical height of the picture.



In double-width film, with which some firms are experimenting, there are many disadvantages. With film of that width special equipment is needed from the start of manufacture of the film until it is shown on the screen. If this double width film comes into general use it will require the scrapping of all the motion picture equipment now in use, with a cost of millions of dollars. It seems to me, after many years of experience in the film industry, that the scrapping of so much equipment is impractical.

However, a change in size of the picture is necessary. Also in the size of the sound track. The present size of the picture is not wide enough to give absolute fidelity of reproduction. Due to its narrow width any weaving of the film while passing the aperture which permits light to pass through the film to the photo-electric cell will cause a change of tone in the reproduced sound. This is often objectionable. The recording of the higher frequencies of sound presents another problem. This has only been partly solved. Sound engineers have increased the speed of photography from 18 to 24 pictures per second. This was done to give a longer sound track. At 24 pictures per second the film travels at the rate of 90 feet per minute, or 18 inches per second.

When a ribbon light-valve is used with an aperture of .004 of an inch the highest frequency that can be recorded is 4/18.000 or 45.00. This is about the highest frequency successessfully recorded by the variable density method. This comparatively low frequency cuts off many of the harmonics of speeech and sounds. This gives rise to the complaints of "tinny or canned" music.

The use of double width film only partly overcomes this difficulty, for although a wider sound track is used the film does not move at a much greater speed than the present film. To be exact, the increase in speed of the wide film is represented by the fraction .936/.750 which is not great enough to eliminate the present re-recording difficulty.

With my method this difficulty is overcome for my method provides a sound track twice as long as at present, and at the same time gives an image twice as wide as the standard—and remember, it is on *standard* size film with standard machinery. For this reason I feet justified in believing that my method will be a boon to the industry, something that will advance the art of the motion picture.

Hints on Kodacolor

FOR THOSE readers who wish to take advantage of the colors of summer and make pictures with Kodacolor film, we print the following excerpt from Ciné-Kodak News. A few simple rules are given, and should be of assistance.

To begin with, make sure that the Kodacolor Filter is properly inserted in the lens barrel. Move the diaphragm pointer to *f*.1.9 and insert the little key on the filter into the slot in the lens barrel. Then push the filter *all the way down*.

With *each* roll of Kodacolor Film a ratio diaphragm is included. This is a small metal ring of special shape that is to be used on the Kodacolor Filter with that particular roll of film. If the ratio diaphragm used is not suitable for that roll of film the proper color balance will not be maintained and the effect on the screen will be unsatisfactory.

When reloading the Ciné-Kodak with Kodacolor Film, compare the letter on the ratio diaphragm included with the film with the one on the filter that was used with the last roll of film. If the letter is the *same*, discard the ratio diaphragm included with the fresh roll of film; if it is *different*, replace the old ratio diaphragm with the new one.

Be sure that you focus accurately *for every scene*. If you are not a good judge of distance, it is advisable to use a tape measure for close-ups, to insure accurate focus.

Be very sure, of course, that you have direct, bright sunlight when you attempt Kodacolor pictures with Ciné-Kodak, Model B. Owners of the new Ciné-Kodak, Model BB, will find the half-speed feature of this camera valuable for making Kodacolor pictures when the sun is not bright.

The neutral density filter should be used for scenes where the light is *exceptionally bright*, such as distant sea or sky scenes, all beach scenes, and distant landscapes and mountains. Full-length or half-length portraits, when the subject is dressed in a white or very light-colored costume, should be made with the neutral density filter.

In the tropics, the neutral density filter should be used on all evenly lighted subjects in sunlight without deep shadows. Whenever deep shadows appear on the subject and for all close-ups, the neutral density filter must *not* be used. This is important.

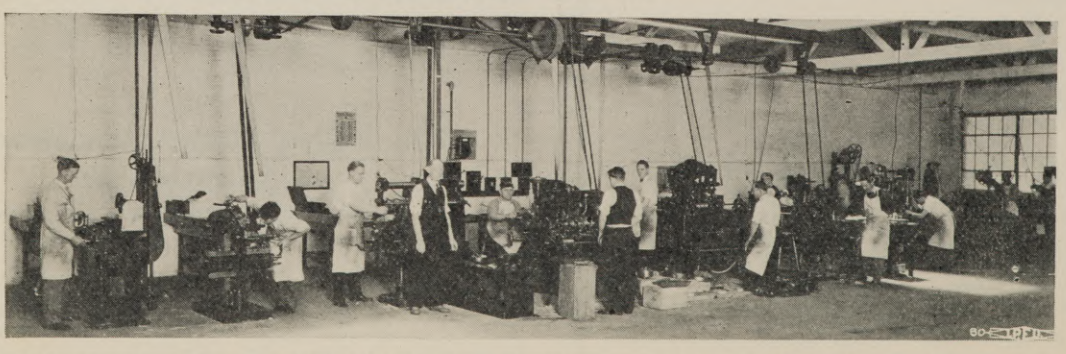
It is advisable to have your Kodacolor Film processed as soon as possible.

Here's One for Golfer's Book

No need for expensive golf lessons now—thanks to the movies. Bell & Howell Filmo Library offers the golfers something interesting in the way of golf lessons. There is one series by Harry Cooper which consists of a separate 100-foot film lesson on each of eleven clubs. Another series teaches golf by the analytical method of Joe Novak, and shows Novak himself giving lessons. This series includes four 100-foot films which may be had either separately or on one reel.

Many beginners in golf, and some whose beginning has been all wrong, are finding these lessons of much value.

However, another suggestion is offered. Let the golfer have slow movies taken of himself with his Victor Cine-Camera, Model 3-T. Then all he has to do is run the Novak picture and then his own. In this way he can see his mistakes. A series of these pictures would be interesting for the golf beginner to look at in future years.



An interior view of the new plant of the Cinema Equipment Company, 7160 Santa Monica Boulevard, Hollywood.

DEATH CLAIMS ALVIN KNECHTEL

THE AMERICAN SOCIETY OF CINEMATOGRAPHERS and the motion picture world as a whole suffered a distinct loss on July seventeenth—a loss that can never be made up. And at the same time the world lost a real man. This man was Alvin Knechtel. The only consolation for his widow, family, associates and friends is found in the fact that Alvin Knechtel died "with his boots on" — Died as he had often said he hoped he could do—died at his work with no knowledge that death wat at hand.

Alvin was killed while driving his own beloved airplane in line of duty for his firm, First National Pictures.

He had been seriously ill for more than a week. Leaving his sick bed, he went back to work and because of the fact that air work on a production was being delayed, he insisted upon taking his plane aloft for preparatory work.

Known in the industry as one of the best air photographers, Knechtel also held the unique distinction of driving his own plane until he was in position to "shoot." Then he would turn the controls over to a pilot and go to work. On July seventeenth he took a "stunt" man, William Hauber, with him and left the ground. He was ill, but his duty overcame his physical weakness. Suddenly he stiffened and apparently fainted, according to the pilot of a plane flying near his, and slumped over the "stick." The plane went into a spin. When the remains of the plane were dug out of the ground the bodies of the two men were found. And Knechtel had died while on the job.

Alvin Knechtel

Knechtel was born in Ontario, Canada, on May 24, 1901. He has had a long and both interesting and brilliant career. He started his cinematographic work in 1915 in a little commercial laboratory in Detroit. He soon was assigned to a camera and during the next four years made several five-reel pictures.

In 1919 he was sent to the South Seas by Famous Players during which trip he made nine pictures for the "Paramount Magazine."

On his return he went with the Banner Productions for a time and then freelanced, producing his own short subjects. He sold much to Pathe with the result he soon joined their staff. He did many notable pieces of work for them and finally evolved a method of producing multiple image and trick novelty photography which placed him in the top ranks of trick cinematographers.

At First National he was an outstanding genius in his line. To replace him will be a big job. Smiling, optimistic, always working — Knechtel was one of the best liked men in the industry.

He was second vice president of the A. S. C., a member of the Board of Editors of the AMERICAN CINEMATOGRAPHER, and chairman of the A. S. C. Research Committee. With his passing the A. S. C. loses one of its most loyal members and one of its finest gentlemen; and a gap is left in the Society's ranks that never can be refilled, for there are no more Alvin Knetchels. The deepest sympathy of every member of the A. S. C. is extended to his widow who has lost a wonderful husband, a sympathetic companion and a real man.

Fine Grain Developer

(Continued from Page 18)

the quantity of sulfite which is used up is relatively small. It is obvious therefore that a solution for reviving the developer should at least contain all these ingredients. In practice it was found with the rack and tank method of development that the developer could be revived by adding half the original quantity of Elon, hydroquinone, and borax, together with a small quantity of sulfite after 80 feet of film per gallon had been processed. These were dissolved in as small a volume as possible of a 10 per cent sodium sulfite solution before adding to the developer.

Curve C (Fig. 6) shows the effect of such revival. (Compare with curve B.) The condition of the developer after 160 feet of film had been processed is shown by curve D. (See also Fig. 7.)

The four curves, A, B, C, and D (Fig. 6) show that 160 feet of film can be processed satisfactorily per gallon of borax developer if it is properly revived at intervals. The revived developer gives the same gamma in a given time of development as the original developer, while the emulsion speed at this exhaustion point is fully 60 per cent of the original.

Tests were made by adding increasing quantities of potassium bromide to a fresh developer and measuring the speed loss. It was found that about 1.5 grams per liter of potassium bromide were required to reduce the speed of the emulsion to 60 per cent of its original value. This content of potassium bromide corresponds with the quantity of bromide present in the exhausted developer as determined by analysis. The quantity of potassium bromide present was determined as follows: The sodium sulfite and developing agents were oxidized in alkaline solution with sodium peroxide and ammonium persulfate. After acidifying, the bromide was precipitated with excess silver nitrate and the excess silver titrated with potassium thiocyanate with ferric nitrate as an indicator. This analysis showed a content of 1.6 grams of potassium bromide per liter in a developer exhausted with 200 feet of film per gallon.

Also a determination of the quantity of bromide liberated in the developer calculated from the quantity of silver left in the developed negative shows that the equivalent of from 1.0 to 2.0 grams of potassium bromide are liberated after developing 200 feet of film per gallon, depending approximately upon the integrated density of the negative.

(D) Sludging Properties of the Developer

Sludging is a normal and unavoidable characteristic of the borax developer. The sludge is made up mostly of finely divided silver and imparts to the developer a light gray muddy appearance. An analysis of dried sludge from a used developer which contained all the foreign matter which accumulated during the processing of 160 feet of film per gallon indicated a content of 40 per cent pure silver.

With the rack and tank method of development where a tank of developer is used over a period of two weeks or longer the developer contains a considerable quantity of sludge after 160 feet of film per gallon have been processed. In the experience of this laboratory the quantity of sludge which forms has never been sufficient to interfere with successful development.

With continuous machine development the sludge may accumulate in the bottom of the tank or tubes as a result of insufficient agitation of the developer. By circulating the developer through a storage tank, most of the sludge settles out in this tank. The suspended silver can also be removed by filtering through a bed of sawdust. The sawdust for this purpose must be extracted with boiling water before use to remove the soluble constituents which might change the characteristic of the developer. The various factors which determine the amount of sludge formation are discussed later under "graininess."

12. The handling of Motion Picture Film at High Temperatures by J. I. Crabtree, Trans. S. M. P. E. No. 19, 39 (1924); Brit. J. Phot. 71: 462 (1924).

A. B. C. of Sound

(Continued from Page 20)

act thus as a shutter of variable apertures, or changes the plane of polarization of a Kerr cell which has the effect of changing the intensity of the light striking a slit according to the modulation of the current. The final effect of these three systems of recording valve is to impress upon the moving film in rapid succession the image of a slit in variable densities.

(To be Continued)

PHOTOGRAPHIC EQUIPMENT CLEARING HOUSE

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WANTED TO BUY—Good used 400 ft.. motion picture camera; Equipment. Full particulars first letter, make, model, extra lens, etc. F. W. Buchanan, 320 Walnut Street, Johnstown, Pa.

FOR SALE—CAMERAS

FOR SALE—120 degree Bell & Howell camera 3 Goerz lenses. Standard and baby Tripods, cases, etc. Wm. Stull, 5341 Russell Ave., Hollywood, or Care A. S. C.

FOR SALE OR RENT—First Class Akeley Outfit complete. Phone GR-4274, or write Dan B. Clark, A. S. C. office.

FOR SALE—Bell & Howell Camera, 170 degree; three Lenses F 2.5, Iris. Mitchell tripod, four magazines, steel cases. Park J. Ries, 1152 N. Western Ave. GRanite 1185.

FOR SALE—Thalhammer Iris, 40 mm, 50mm, 75mm F 3.5. Lenses in B. & H. mounts. Park J. Ries, 1152 N. Western Ave. GRanite 1185.

FOR SALE—Akeley Camera; 2 inch, 3 inch and 6 inch lenses; finders to match. Eight magazines. Carrying cases for camera and magazines. Akeley tripod with new legs. 180 degree adjustable shutter. $950.00 cash. Camera has been overhauled and is in splendid condition. Phone HE-8116, or write Elmer Dyer, 951 N. Spaulding Ave., Hollywood, or care A. S. C. Office, GR-4274.

FOR SALE—One 5x7 Press Graflex Camera, with 8½-inch F 4.5. Zeiss Tessar lens; one 5x7 cut film magazine; one roll holder; one focusing back; and sole leather carrying case. Price, $95.00. All in new condition. Fred A. Parrish, 2526 West Colorado Ave,. Colorado Springs, Colo.

FOR SALE—Bell & Howell camera complete. Also Bell & Howell trunk. Baby tripod and Mitchell tripod. 40 m.m., 50 m.m. and 75 m.m. Astro lenses; Carl Zeiss 50 m.m. Mitchell Finder. Five Bell & Howell magazines; carrying cases for all, and miscellaneous equipment. Phone GL-7238 or GR-4274.

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FOR SALE—Two slightly used Mitchell Matt boxes at $40.00 per set. Call Chas. Glouner at Universal Studios. HEmpstead 3131.

FOR SALE—One 75 M.M. Astro Lens. F 1.8; One 50 M.M. Graff Variable Focus Lens. One 25 M.M. Carl Zeiss Lens. F.2.7. J. R. Lockwood, 1108 N. Lillian Way. GR-3177. Res., Douglas 3361-W.

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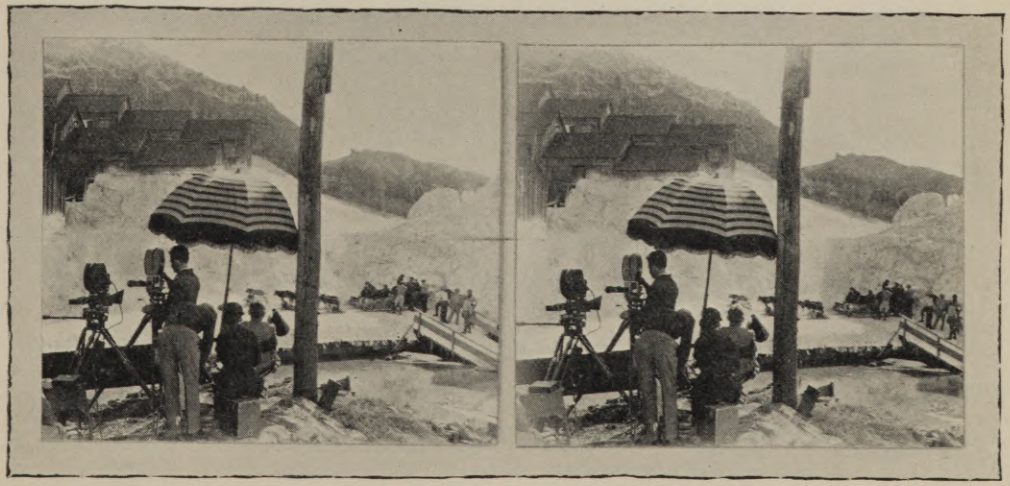
FOR RENT 1 8x10 Still Camera, focal plane shutter, complete. 1 Mitchell Friction Tripod, new, for B. & H. 1 Eyemo Camera with special lock. 1 4x5 Graflex B. & L. lens. 1 B.-H. Low Boy to fit new style B.-H. Tripod head. Joe LaShelle, 639 N. Sierra Bonita, ORegon 6730.



Quick, Watson! The Umbrella!

Here is one of Charles Clarke's stereoscopic shots, which will be a feature in each issue of this magazine for some time to come. This is a movie company shooting snow scenes. But Clarke doesn't tell us why the umbrella is in use. Cut out this picture and paste it on card-board and use it in your old-time stereoscope. We plan to give you a collection.

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